SEVENTY-THIRD YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXVII. NUMBER 7] NEW YORK, AUGUST 18, 1917 [10 CENTS A COPY $4.00 A YEAR

How produce often looks when unloaded at city freight terminals

Condition of a carload of potatoes on reaching New York

A New Freight System to Conserve Our Foods

By James Anderson

EVERY day at the great market terminals in New York city, in fact in almost every city in the United States, thousands and thousands of pounds of perfectly good food—potatoes, onions, squash, beans, cabbages and other vegetables and fruits are set aside, because in the course of transportation the top layer has been bruised or because the original containers have been broken and much of the contents spilled out over the cars.

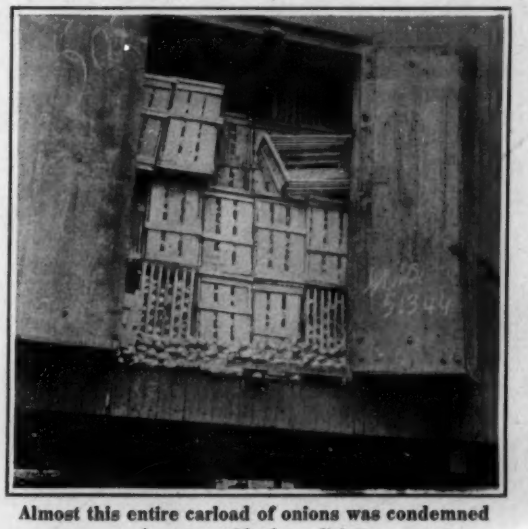
If the consignor were on hand to repack it much of this valuable food could no doubt be saved, but he isn't and the railroads haven't the time or men to do it. In fact, it has never seemed to be anybody's business and, just because nobody up to the present time has cared enough to take the pains to salvage it, every day most of these hundreds of damaged crates, boxes and barrels, with their contents, are carried off to be incinerated or otherwise destroyed as waste or rubbish.

When this tremendous food waste is considered it is no wonder we have high prices for really plentiful eatables; yet, almost without protest, except from the shippers, this sort of thing has been going on regularly for years. However, the war has made us alert to our extravagances, and this tremendous wastage of food has finally received the serious attention it deserves from the only direction from which it can be stopped, namely the railroads themselves.

One of the big eastern railroads is about to put into operation a brand new plan of freight handling which, it is expected, will conserve, for the use of the consumer, thousands and thousands of tons of perishable freight, yearly. This should help greatly in reducing costs at the terminals and should add materially to the plentifulness of the supply, besides saving the shipper many needed dollars by assuring him prompt delivery of his produce, in good condition.

While the railroad might have had these facts in mind when working out this plan, it is more than likely that their principal object was to conserve their badly needed car supply and prevent to an extent the tremendous freight blockades which for months have congested all seaboard terminals and not infrequently resulted in the entire loss of carloads of perishable freights.

The present custom of receiving less than carload freight indiscriminately, at all stations, at any time of the day, for all destinations, will be abolished. In its place there will be substituted a carefully devised plan whereby the acceptance and loading of freight, in less than carload lots, will be conducted according to a regularly established system, and such freight will be automatically concentrated into full loads at the point of shipment.



Almost this entire carload of onions was condemned because of bad condition

The two most important features of the new plan are:

1. The inauguration of shipping days on which cars will depart from various points of origin to specified destinations; freight will be accepted on the proper shipping days only, and the cars will positively depart on schedule.

2. The designation of particular stations at which freight will be exclusively received for specified destinations; freight for such points will be accepted at the stations named only.

The primary purposes for the adoption of the new method are four-fold:

First. Elimination of the delay incident to the rehandling of perishable freight under the present methods of consolidating small shipments into full carloads at transfer stations; this will give the farmer much quicker service than is possible under the old method.

Second. Conservation of car supply by effecting better average loading than is possible under the transfer system; this will increase the capacity of the whole railroad plant, and will release trackage and locomotives for the movement of troops, Government supplies and commercial freight.

Third. Reduction in the number of car and train movements required to transport a given volume of freight; this will increase the capacity of the whole railroad plant, and will release trackage and locomotives for the movement of troops, Government supplies and commercial freight.

Fourth. Improvement in the regularity of the freight service from the farm to the terminal, systematizing and simplifying operations; this will result from the elimination of a large proportion of the complicated rehandling of freight, which is now unavoidable, with the attendant great liability to damage and utter loss.

Under the present method of handling less than carload freight, a shipper having a small consignment to transport from town "A" to city "B" can take his goods to any freight station in town "A" at any time during the ordinary working hours. In the course of the day, or perhaps the next two or three days, the freight will be loaded into a car and run out to a transfer station, which may be a few miles or more than a hundred miles distant. There it will be unloaded and trucked into another car, in which numerous small shipments, from many other points, for city "B" are being consolidated in the effort to make up a full car.

Under the proposed plan, there will be certain days on which less than carload freight for city "B" will be accepted at one or more specified stations in town "A" and such freight will be accepted only on the days, and at the particular station, or stations named. On the days specified, a car for city "B" will leave the originating station

(Concluded on page 121)

No produce man can be blamed for not making an effort to salvage vegetables when they arrive in this condition

SCIENTIFIC AMERICAN

Founded 1845

Published by Munn & Co., Inc., 233 Broadway, New York, Saturday, August 18, 1917

Charles Allen Munn, President. Frederick C. Beach, Secretary. Orson D. Munn, Treasurer. all at 233 Broadway

Entered at the Post Office of New York, N. Y., as Second Class Matter
Trade Mark Registered in the United States Patent Office

The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

Norway and the North Sea Net

AT the present writing the principal obstacle to the construction of a net across the North Sea is the action, or rather, the inaction, of the Kingdom of Norway.

Norway, like every other maritime country, is bordered by a three-mile strip of water, which, by international agreement, is neutral. Norway does not own this strip of water; she is simply responsible for the maintenance of its neutrality. When the builders of a North Sea net reach the outer line of this three-mile strip they will have to stop operations—*provided it is certain that Norway is doing everything in her power to prevent any of the nations at war from using this three-mile strip for belligerent purposes.*

Now it is a notorious fact that, ever since Germany started out to commit murder and piracy on the high seas, her instruments of slaughter, in the shape of the U-boats, have been violating the neutrality of Norwegian territorial waters by using them as a channel of communication between her U-boat bases and her fruitful field of operations in the Atlantic. The British patrol across the North Sea is so watchful and the boats so numerous as to make it hazardous for the U-boats to run through the line except on dark nights or in foggy weather.

Norway has known just as well as Great Britain and the United States have known, that the Germans were rendering useless the North Sea patrol, by sneaking through the neutral Norwegian waters into which Great Britain has forbidden her patrol boats to enter. Great Britain is as anxious to respect the neutrality of small powers as Germany is brutally cynical in violating it. The question arises, then, as to whether a neutral power which deliberately permits the violation of its neutral waters, to the great advantage of one belligerent and the equally great disadvantage and hurt of the other, has not herself become, by acquiescence, a violator of neutrality and thereby lost all title to act as guardian of the neutrality of the waters affected. If Norway claims that she is unable to protect herself against German violations, it becomes the duty, surely, of the nations whose interests are most affected, to step in and do that which Norway cannot do, and, in this case, prohibit the passage of German warships through these neutral waters for warlike purposes. The most effective way to do this would be to extend the North Sea net across Norway's three-mile zone right up to the Norwegian coast.

It would be entirely reasonable for the United States Government to represent to Norway that by permitting German U-boats to use her territorial waters, she is exposing our communciations with France to attack and subjecting our troops to an exceedingly grave risk. Furthermore, it would be entirely in agreement with the laws of neutrality to tell Norway that if she could not close the three-mile U-boat channel herself, we should have to do it ourselves.

It is probable that if Norway closed the territorial waters by a net Germany would declare war upon her; but even if she did Norway would be in no worse plight, and indeed in some respects would be in a better plight, than she is today. Germany has been sinking her ships wholesale, and in other respects has been playing against this little Kingdom the part of international bully. If Norway came into the Entente Alliance, she would have the might of the Allied fleets for her defense, and the food question would receive an immediate solution. Norway is very much worked up over the question of our embargo on foodstuffs, as witness the presence of Nansen and his Committee in our midst. Would not this be a most opportune time to settle the two questions? What Norway needs just now is a bold and fearless attitude, based upon a determination at least to stand up bravely for her rights. Let her close her territorial waters to the German U-boats, and there will not be much difficulty in settling the question of food imports.

Allied and Neutral Shipping Losses

IN the absence of any detailed official statement of the facts, it is difficult to make a reliable estimate as to the total losses, or the rate of losses of shipping, due to German U-boat depredations. The people who do know won't tell, and when official statements are made by leading men, lay or military, they are so contradictory as to leave one in a state of positive bewilderment. Hence the following study of the question does not claim to be highly authentic; it is merely our own estimate based upon what we consider to be the most reliable statistics.

The first difficulty that confronts one is the statement frequently made in Washington, and made by men in more or less official positions, that the British are concealing their losses. By this it is meant that not only is concealment involved in publishing merely the number of ships sunk, without giving their tonnage, but that these very numbers as given week by week are understatements of the truth. Personally, we do not believe for a moment that the British are deliberately lying about their losses. It is not their way. In fact, the recent publication of scathing reports of military failures shows that, if anything, they lean too far toward a brutal self-exposure.

We may take it, then, that the weekly statement of British losses is correct so far as it goes. That it does not give the total tonnage loss is to be regretted; but this fact does not invalidate the truthfulness of the figures showing the total number of ships lost.

Now the record of British losses from the opening of the ruthless campaign to date shows that the U-boats have sunk on an average 20 ships per week of over 1,600 tons. If we assume that the average size of these ships was 5,000 tons (4,500 tons would probably be nearer the truth; but we wish to be over rather than under the true figure), and if we assume an average of 1,200 tons for the ships of under 1,600 tons, we find that by January 1st, 1918, the British will have lost during the intensive U-boat war 5,720,000 tons over and above that lost in 1917 before the campaign started. Such statistics as have been published of the French and Italian losses, worked out on the same basis, indicate a loss for these countries of 1,145,000 tons. If we assume that the losses of the neutral countries are proportional to the total amount of neutral tonnage, as compared with the total amount of British tonnage, we find that the neutrals have lost to date, 2,250,000 tons. Summing up, then, we reach the conclusion that, if the rate of sinking which has obtained during the first half of this year be continued throughout the rest of the year, the Allies and neutrals together will have lost between January 1st, 1917, and January 1st, 1918, about 9,500,000 tons.

Lord Beresford, an English statesman who has consistently urged that the public should be made fully acquainted with the extent of the U-boat depredations, stated recently in the House of Lords, that from August, 1914, to January, 1917, the British, Allied and neutral losses were 4,000,000 tons. Adding this total to the total estimated losses for the present year, we find that by January 1st, 1918, the Germans will have sunk about 13,500,000 tons of shipping.

As an offset to this loss, we have the construction of new shipping and the placing in service of the interned German vessels. In making an estimate of the ships which will have been built from the commencement of the war to January 1st, 1918, we must bear in mind, that although in the earlier period of the war there was a great falling off in British merchantship construction, the total having fallen in one year to about 650,000 tons, Great Britain having now brought her fighting navy up to sufficient strength, is bending her enormous shipbuilding capacity to the turning out of a maximum amount of merchant tonnage; and it is probable that by the end of this year she will have set afloat during the war 3,500,000 tons of new shipping. Our own record during the same period of war will be about 2,250,000 tons, while France, Italy, Norway and Sweden will have set afloat about 1,500,000 tons.

The total amount of shipping, then, built in all countries during the three and a half years of the war ending January 1st, 1918, if these figures are correct, will be about 7,250,000 tons. If we add to this total the interned German and Austrian ships, estimated at 1,750,000 tons, which by that time will have become available for the carrying trade, we reach a total of 9,000,000 tons, with which to offset the total loss to that date of 13,500,000 tons. This would leave a net loss to the Allied and neutral powers of 4,500,000 tons.

Now in August, 1914, the total world's shipping amounted to 49,000,000 tons. Deducting the tonnage of the Central Powers, which was 6,600,000 tons, we get a total of 42,400,000 tons for the Entente (including ourselves) and the neutral powers. Deducting from this the total net loss of 4,500,000 tons, as found above, the tonnage remaining available for service on January 1st, 1918, will be 37,900,000 tons.

Now, if it be assumed that the U-boat sinkings will be maintained during 1918 at the rate which they are accomplishing in 1917, namely, 9,500,000 tons, let us see how far that may be offset by new construction during 1918. Lloyd George has recently stated that Great Britain would set afloat 4,000,000 tons, and if we assume that the United States will build 3,000,000 tons and the other powers 1,000,000 tons, we reach a total of new construction of 8,000,000 tons for the year, which would leave a net loss for the year, suppcsing the Germans continue to sink ships at the present rate, of 1,500,000 tons for the year. From these figures it is evident that unless the Germans make a great spurt in their U-boat campaign, the new construction will nearly equal the losses.

If our estimate as given above is approximately correct, it must be admitted that the prospects of Germany's succeeding in her U-boat campaign are very remote. To succeed, two things must happen: Germany must greatly increase her rate of sinkings, and the Allies must break down in their attempt to build shipping at the rate which their public men have predicted.

If the Allies will only build the North Sea net from the Scottish coast to Norway's territorial waters, and if Norway will protect the neutrality of those waters by building her three-mile section of the net, that 9,500,000 tons of prospective losses next year would vanish from before the eyes of the slowly-awakening German people.

Indirect Economies in Dried Foods

MUCH has been said urging upon the public the advantages of dehydration or desiccation of food. While it is of course the case that at the present time the chief aim of this propaganda is the conservation of food values that otherwise would be lost, the drying process has other things than that to recommend it.

Food must be kept in some form or other from the growing season into the winter. The usual method for doing this has been by ordinary canning, in which the entire bulk of the fruit or vegetable, including the water in it, is put away, and kept from spoiling by the use of sugar or by excluding air. If any considerable quantity of the green groceries which would normally be thus treated are to be dehydrated, the saving in storage space will be a noticeable item, and the economy of sugar will be another. It goes without saying that if dehydration eliminates 90 per cent of the bulk, ten times as much can be stored in a given space. This is perhaps not so much of an object with the farmer who has ample space in which to store his winter's food anyhow; but for the city housewife, and especially for the dweller in the modern apartment devoid of closets, it looms very large, and it would be a boon indeed to the cold storage man.

A further consideration which inheres in the reduction of bulk and weight is transportation costs. It is perfectly absurd to ship tons and tons of water about the country in the form of fresh or preserved foods. New York and Chicago and the other large cities have plenty of water of their own for every conceivable purpose; why should they pay freight on six or seven tons of water from Florida or California, Delaware or Michigan, every time they bring in a ton of real food value from one of those localities? In the course of a year the amount of water hauled by our railroads must reach a staggering figure. If the food were desiccated before shipment this would cease; and not only would the consumer benefit from whatever share of the reduced cost the middleman might condescend to allot to him, but a very real economy would be effected in car space, which is so extremely valuable just now.

Finally, there is the matter of containers. For home preserving glass is used; for commercial purposes, where shipment is necessary, the canner is almost driven to tin plate. Every housewife knows that glass jars have kept pace with the rising costs in other lines; and ability to use pulp or fiber or paper containers of one sort or another would be a genuine relief. In the commercial canning field the release from the necessity of using the tin can would be even more of an object, not only from the viewpoint of the immediate effect upon expenses, but from that of the tin-plate industry as well. In few cases is the war-time rise in prices better founded upon increased demand and reduced supply than here. If we could convert to better use the tin which ordinarily goes into the tomato can and its brothers and cousins, substituting for it a material with fewer direct applications to the making of munitions, we should do very well indeed. We need hardly point out that this is possible if we undertake to remove the water from our foods before putting them up for the winter, since the sole object of the tin can is to keep the water in foods which have been preserved in the traditional ways.

Rebuilding a Storm-Stricken Town

ACCORDING to *Science*, the Department of Architecture of the University of Illinois is preparing to take an active part in the reconstruction of the town of Mattoon, recently devastated by a tornado. Plans for 16 houses to cost from $800 to $1,400 are to be prepared by architects of the department, who hope to duplicate this enterprise on a larger scale in France.

Naval and Military

The Cost of War.—Senator Smoot, a member of the Finance Committee of the Senate has stated that the cost to this country of the war, in actual expenditures will reach the stupendous figure of $17,000,000,000 for the first twelve months. The Army estimates are based upon the organization, equipment and sustenance of an army of 2,000,000 men. This includes the Regular Army, 387,000; National Guard, 400,000; National Army 500,000; Auxiliaries, 100,000 and the second quota of drafted forces.

German Propaganda?—The return of eleven United States Army officers from France, England and Belgium, where they were sent to observe military conditions, was seized upon by German sympathizers to reiterate in the press the statement that the line on the Western front is impregnable. They have been saying this for years; but this time they put the statement on the lips of our returned Army officers. The lie was promptly nailed by Secretary of War Baker, who said: "The mission is unanimous in its praise of the splendid morale of the Allied forces on the Western front."

How Torpedoes are Exploded.—The early torpedoes were detonated by means of a striker pin, which projected axially from the warhead, and, upon contact with a ship, was driven in. This had the objection that, if the torpedo struck a glancing blow, the pin might not be operated and there would be no explosion. In the present type, the firing of the charge is done by the inertia of a small steel hammer or striker, which, when the torpedo is not in use, is held in place by a catch at the inner head of a safety pin. When the torpedo is fired, its progress through the water causes a little propeller on the safety pin to rotate a nut, which draws the pin forward, releasing the hammer and leaving it free to move. The least shock, ahead or lateral, causes the hammer to move and fire the charge.

Breaking the German Morale.—In a war of position such as the German Army has been condemned to on the Western front, so great is the power of defense afforded by the concealed machine gun, that it is practically impossible to break a well-manned line on a scale that would be fatal to the defending army. Hence the object of the Allies is to break the morale and diminish the numbers of the defense until a point is reached when the line must crumble because of the breakdown of its human material. The object of the Allied commanders is to break up the German Armies. This can be accomplished just as well in France and Flanders as on the German side of the Rhine. The depletion of German man-power is shown by the presence of the 1918 and some of the 1919 classes at the front.

The Value of Rifle Shooting.—The *Army and Navy Gazette* of London, commenting on the great value of good rifle shooting in the present war says: "Happily the military authorities have not been misled by the results achieved by the big guns, the bombs, and the various missle-throwing trench weapons into imagining that the infantry soldier has ceased, or was likely to cease, to be primarily a rifleman, and the good work which was initiated before the war at Hythe and at Bisley, and at regimental rifle meetings, has been continued and expanded at the many musketry schools which have been established behind the front in France, where selected officers and men of our forces have been taught all that was to be got out of the service weapon. The result has been shown in the account we hear of the wonderful rifle practice made by our troops in the fighting around Bullecourt, reminding us of the stories that used to reach us during the retreat from Mons of how German mass attacks withered up under the fire of our infantry of the old army."

Ships of Cast Steel.—With Norway building 3,000-ton ships of reinforced concrete, the proposal recently made to build ships of cast steel demands more than an ironical rejection. Recent improvements in metallurgy have left their mark upon the manufacture of cast steel, which today, because of its increased toughness and higher tensile strength, is being used for many purposes for which a few decades ago it would have been considered an impossible material. We do not say that the thing can be done; but the study of the problem which is now being made is decidedly of interest. It is proposed to build the ships in sections and to weld the sections together electrically. Each section, whether for the bottom or the sides, would be cast with such ribs and other stiffening members as would be necessary. The sections are to be eight or ten feet in length measured on the longitudinal axis of the ship. It is proposed to have one such section for the bottom and two others for the sides, a fourth section forming the deck framework. The designer believes that by the use of manganese supplied through the soldering the resulting electrically-welded joint would have 125 per cent of the strength of the casting itself. It is also proposed to erect blast furnaces and open-hearth furnaces at the shipyards, and it is estimated that more tonnage could be turned out per month than by the ordinary methods.

Science

The Narratives of Early Dutch Voyagers are being reproduced on an extensive scale in Holland by the Linschoten Society, an organization analogous in its aims to the Hakluyt Society in England. The Dutch society was founded in 1908 and has already issued many notable records, with facsimile reproductions of maps and pictures.

The Rôle of Winter Cold in Plant Growth has recently been described by Dr. F. V. Coville. After the period of growth in spring and summer there is a period of dormancy before cold weather sets in, and if plants are maintained artificially at a high temperature this dormant period persists. Exposure to cold is needed to activate the plant for another period of growth. Perhaps the liberation of enzymes acts on the stored starches, converting them into sugars, or the phenomenon may be due to a change in the permeability of the cell membrane. Though normally the stimulus required for a renewal of growth is supplied by cold, mechanical injury or a period of drying may have the same effect. The process occurs independently in any exposed part of a plant, so that if one of two branches of a plant is kept continually warm while the other is subjected to the usual winter chilling, the former will not develop on the return of summer temperatures, though the latter develops as usual. It would be interesting to learn what stimulus takes the place of cold in the equatorial regions.

Tuberculosis in France.—According to Dr. Herman M. Biggs, of the New York State Department of Health, tuberculosis has been a serious problem in France during the present war, contrasting sharply with the small part played by the epidemic diseases which have figured so prominently in previous wars. Even before the war France had three deaths per thousand from tuberculosis, as compared with one per thousand in England and one and five-tenths per thousand in New York State. After the mobilization of the army the hardships of military life resulted in cases of latent or arrested tuberculosis manifesting themselves on a large scale, and by the end of 1915 no less than 86,000 French soldiers had been invalided home on account of this disease. Up to February, 1917, about 150,000 had been returned for this cause. It is said that from one-half to one per cent of the 4,000,000 men now on the active list of the army have tuberculosis. In the whole French nation Dr. Biggs believes there are from 400,000 to 500,000 cases of tuberculosis, and France is said to be conspicuously deficient in the special facilities, personal and material, for dealing with this scourge.

Military Applications of Geology.—The fact that the United States Geological Survey has furnished a very large contingent to the Engineers' Officers' Reserve Corps is one of the tokens that American geologists realize that their science is called upon to play an important part in a war conducted on scientific principles. There is a geological committee under the National Research Council, and it has recently published a pamphlet by R. A. F. Penrose, Jr., entitled "What a Geologist Can Do in War." Lastly, Joseph E. Pogue, of Northwestern University, contributes to *Science* of July 6th a suggestive article on the subject of "Military Geology." Some of the problems with which the geologist can deal are the selection of camp sites, the location of trenches and tunnels, the choice of ground for artillery positions, with reference to the firmness and elasticity of the underlying rock, the investigation of water resources in regions of prospective occupation, the preparation of geological maps for strategic use, etc. At home a great task of geology in time of war is to aid in developing the mineral resources of the country in order to meet the demand for the raw materials of warfare.

Scientific Agriculture in China.—Since the year 1907, when an agricultural experiment station was opened by the Chinese government in Peking, a rapidly increasing amount of attention has been paid by the Chinese to scientific agriculture. An agricultural college and experiment station has since been established at the capital of each province, besides many additional experiment stations, so that there are now 130 of the latter in the 22 provinces—more than twice as many as exist in the United States and its possessions! In Chili province alone there are 31 agricultural experiment stations. China has two cotton experiment stations, and is considering the establishment of another. Experiments are made at these stations in seed selection, seed distribution, plant harvesting, soils and manures, treatment of pests, and cotton weaving. Stock-raising experiment stations have been opened at Kalgan and Shih Men Shan (Anhui). In 1916 China established a department of forestry, with a forest commissioner in each province. Forestry experiment stations and training schools have been established at Ch'ang Ch'in Hsien (Shantung) and in the Temple of Heaven, in Peking. The American-supported university at Nanking has maintained a college of agriculture and a school of forestry for several years.

Electricity

Glass Push Pins for Low-Voltage Wiring.—Glass push pins provided with an eyelet for use in temporary low-voltage wiring are being made by a well-known manufacturer. The pins are easily attached to woodwork or walls, and it is pointed out by the maker that they are particularly useful for amateur battery work where small wires are to be run about the house.

Electricity and Molybdenite Ore.—It is reported that a Canadian firm, which has six electric furnaces for the treatment of molybdenite ore, has an output of 500 to 700 pounds of ferromolybdenum per day and intends to increase the number of furnaces in the near future as well as to run the furnaces night and day so as to produce 1,100 pounds per day of 24 hours. It is claimed that the molybdenite ores treated at this plant produce very hard and tough high-speed steel.

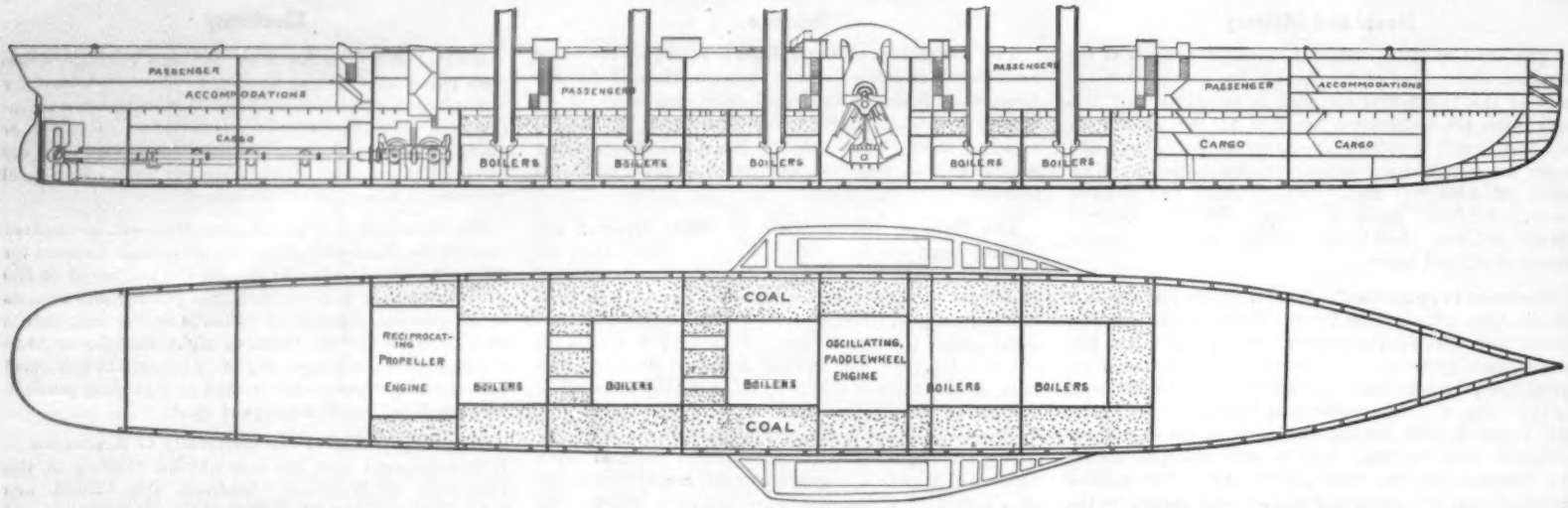
Wireless Station of the University of Wisconsin.—It is announced that the new physics building at the University of Wisconsin, Madison, Wis., which was begun in the early part of 1916, is practically completed and will be ready for the students this fall. The physics department will occupy the largest part of the building, and three floors will be devoted to laboratories, offices and lecture rooms. A wireless station will be situated in the new building, and an aerial tower will be built on top of the hill with the antennae strung to the new building.

Telephonic Installations in Yucatan.—The telephonic equipment in use in the cities of Progresso and Merida, Yucatan, Mexico, are of an antiquated Norwegian make. The service is unsatisfactory and inconvenient. Public sentiment is strong in its demand for a better service and two of the leading industrial and commercial organizations are installing temporary, independent telephonic connections between their Progresso and Merida offices. The time is opportune for American manufacturers of telephones to get in touch with the proper interests in Yucatan, some of who have expressed their desire to receive correspondence and literature on this subject.

An Interesting Electroculture Equipment was recently exhibited in England, and in these days of threatened food shortage it attracted no little attention. The equipment, which was designed for farm conditions and is being practically used, consists of a transformer with mercury break for continuous current, the equipment being housed in a small weatherproof hut which is easily portable. The transformer is provided with an adjustable spark gap, and the high-tension lead is taken out through a substantial porcelain insulator. This insulator is protected from rain. On the occasion of the demonstration, continues *The Electrician*, the high tension side was connected to a Lodge valve and thence to the overhead wires.

Telephoning from a Moving Train.—Successful experiments with a telephone apparatus installed on a railroad car were carried out recently by a representative of the signal department of the Canadian Government Railways and the inventor of the device, the former in the car itself and the latter in the dispatcher's office in the Moncton yard. The transmission in this system of communication is made through wheel and axle without the assistance of any contributing medium. Reports of the tests declare that the communication established was in every way satisfactory, although the train was in motion. It is said there was no difficulty in hearing distinctly every word of the messages exchanged. The experiment was tried on a double-track line where the rails are properly "bonded" for the block-signal system, but it is claimed that equally good results can be obtained on any track where the rails are similarly "bonded" without regard to the presence or absence of a block-signal installation.

Better Tungsten Filaments.—In a recent issue of *Engineering* there is described a peculiar method of preparing tungsten filaments which are ductile in spite of being squirted. The process, which was described by Dr. W. Böttyer before the December meeting of the Bunsen Gesellschaft, is employed by Julius Pintsch, and is due to Messrs. O. Schaller and Orbig. Members of the society were able to watch the process in the works after the meeting. The metallic powder is mixed with 2 per cent of thoria and kneaded into a paste with addition of some binding agent. A thread is then squirted. The thread is first pre-heated and then rapidly heated up to 2,400 deg. C. or 2,600 deg. C., the object being to make the crystallization of the metal more rapid than the passage of the wire through the hot zone. The first apparatus used for this delicate operation had the dimensions of several meters; the actual apparatus is only a few centimeters in height. The resulting wire is said to consist of crystals several meters in length, though only a few hundredths of a millimeter in thickness, the cross-section comes out octagonal rather than circular. There are very few joints in a wire. A re-crystallization of the filament after long-continued use of the wire is said not to occur.



This remarkable ship was built in 1858. She was constructed on the "safety first" principle. She had a double hull; fifteen transverse bulkheads, carried up 30 feet above the waterline; two longitudinal bulkheads and other safety features. It is doubtful if a torpedo would have sunk her

PROFILE AND PLAN OF THE "GREAT EASTERN," THE SAFEST MERCHANT SHIP EVER BUILT

The Submarine Problem—XII.

The Torpedo Can Be Beaten by the Watertight Bulkhead

By J. Bernard Walker

BROADLY speaking there are three ways to meet the German U-boat's menace:

1. To shut them out of the Seven Seas by shutting them within the North Sea.

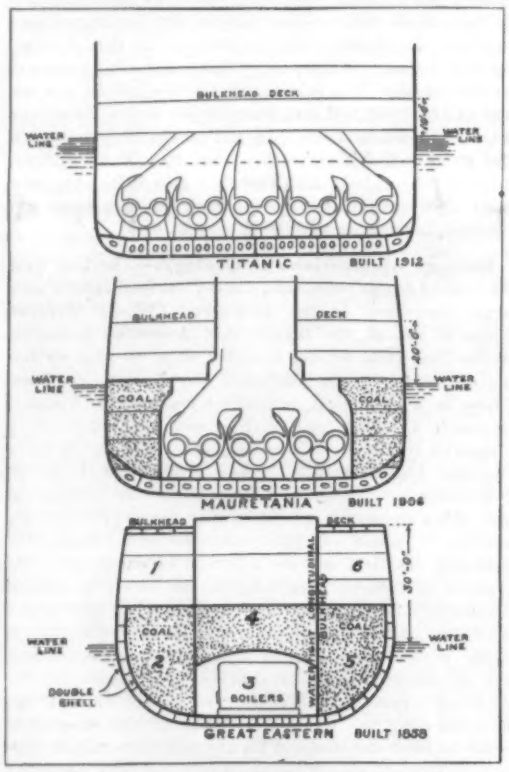
2. By letting them roam at will in the depths below the Seven Seas and trying to find them with craft on the surface.

3. By building merchant ships with such elaborate subdivision that no single torpedo can sink them.

Is it possible to build an unsinkable ship? It certainly is; for over half a century ago Brunel produced in the "Great Eastern" a ship which was more entitled to be called "unsinkable" than any merchant ship which has been built from that time to this. Brunel was a technical genius. He was one of a coterie of great engineers, men who inspired such confidence that they were given a free hand when they set out to do their designing, and were not hampered by the ignorant criticism, or the parsimony, of committees and boards of directors.

Brunel conceived the idea of building a 700-foot ship at a time when most ships were not over 200 to 300 feet in length. He realized that the first duty of a ship is to stay afloat, and that she should be so designed that she could pass through any of the ordinary accidents of the sea without going to the bottom. So he built his ship with a double hull, which extended not merely across the bottom of the ship, as it does in modern vessels, but up the sides to ten feet above the water-line. Here it was connected to a watertight iron deck (the whole ship was built of iron). The space between the inner and outer hulls was about three feet wide, and it was most elaborately subdivided by longitudinals and by transverse frames. Then Brunel divided the interior of his double-hulled ship by fifteen bulkheads, nine of which extended 30 feet above the water-line to connect with the top deck, which was also a watertight deck. Not content with this, Brunel ran two lines of longitudinal bulkheads through the central portion of the ship. The "Great Eastern" was a magnificent ship, and she was built so well that, outside of the Navy, there never has been a ship that could compare with her for protection against sinking. So good was she that on one of her early voyages to New York, she ran on the reefs at Montauk, tearing a hole in her bottom ten feet wide by eighty feet long, and yet steamed safely down the Sound, anchored in Hempstead Harbor, and was there repaired by the caisson method without going into dry dock. Later she made many successful voyages.

From that date, 1858, to the present time there has been a steady deterioration in the protective elements of merchant ships. Brunel built his famous liner on the "safety first" principle. Since that time the commercial man, who is rarely an idealist, and generally very much the other way, has thrown out, one by one,



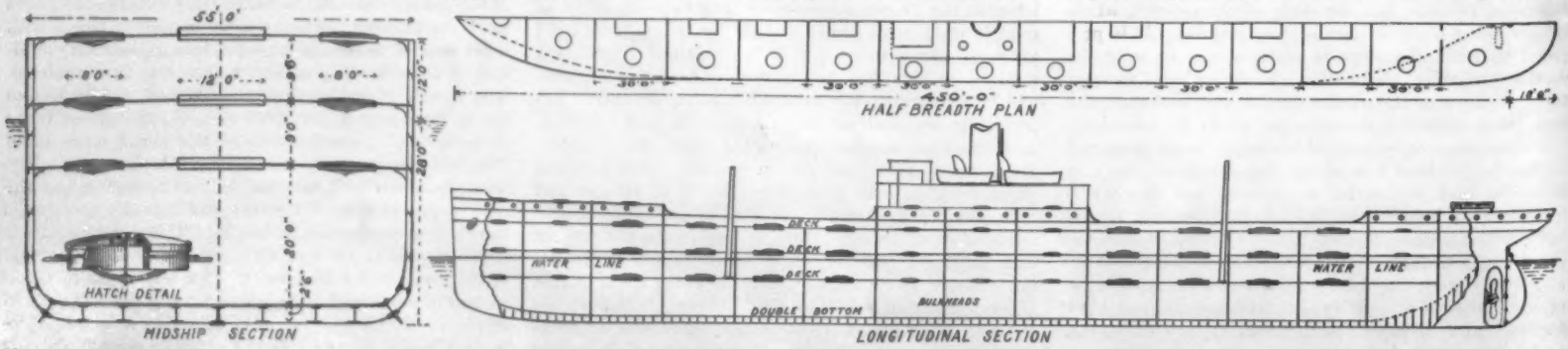
Two extremes of bulkhead protection and a compromise

those safety elements which Brunel incorporated in his ship, until today the chance of a ship surviving a heavy collision or the blow of a torpedo is about one in one hundred.

Let the reader look at the accompanying cross-sections of the "Great Eastern," the "Titanic" and the "Mauretania," and he will read the story of how safety has been sacrificed to commercialism. First, out went the double hull, only the double bottom being retained. Out went the watertight deck, which served to keep inrushing water confined to the lower holds. Out went the lofty transverse bulkhead, carried 30 feet above the waterline, even to the very top deck of the ship. The process of deterioration went on until the building of the "Titantic." This ship, heralded as a masterpiece of twentieth-century design, was built with a single shell, with widely spaced bulkheads whose tops were carried only about ten feet above the waterline, as against 30 feet in the "Great Eastern", bulkheads which finished not against a watertight deck, but against a deck which was pierced with many openings. Consequently, when the ship's side was ripped by the submerged shelf of an iceberg, the water flowed up through the non-watertight deck, found its way aft, and poured into successive compartments (see diagram) until the ship finally upended and went down bow first.

In the endeavor to counteract the submarine sinkings, we are about to build a great merchant fleet, and if we do the sensible thing, which we probably will not, we shall so subdivide and otherwise protect these ships that a single blow from a submarine will not sink them. The trouble in this matter, and in many other matters connected with the war, is that we are thinking too much about after-the-war conditions, at the expense and to the detriment of war preparation. It would be perfectly possible to build unsinkable merchant ships; but to do this it would be necessary for the shipping companies to sacrifice a considerable portion of the cargo-carrying capacity of their ships. The shipping men, who care more for prospective private profits than they do for the speedy prosecution of the war, are not willing to sacrifice space and build unsinkable ships.

The naval constructors of the United States Navy have worked out a system of construction involving elaborately subdivided torpedo-defense spaces, which is so effective that they are willing to guarantee and apply the system to merchant construction. They believe that they can turn out merchant ships that would be proof against sinking by the torpedo. But since the shipping interests are many of them thinking more about future profits than the present needs of the nation, and since they seem to be able to get pretty much what they want these days, all that can be done is to compromise the matter and find some simpler method of providing our ships with a fair amount of protection.



Narrow compartments, with doorless bulkheads reaching to a watertight deck (the topmost deck) would provide a cheap, comparatively torpedo-proof construction. Two gas-venting hatches on each deck would help to neutralize the explosion

We have given some thought to this matter and submit, merely as a study, the accompanying outboard profile, cross-section and deck plan of a freighter designed to pass through the submarine zone.

To begin with, we have omitted the double skin—this for the reason that both skins would be burst in by a modern torpedo and the inner skin would merely furnish an additional number of flying fragments, to be carried under high velocity into the ship. The principle adopted is that of numerous transverse bulkheads, carried up to the upper or main deck of the ship, which deck is of steel and built thoroughly watertight. The transverse bulkheading would be located very much closer together than the present practice—25 feet apart in vessels of 4,000 to 7,000 tons, the widths increasing proportionately to the increase in size of the ship.

Professor Biles of Glasgow, who designed those famous ships, the "Paris" and "New York," used this method, building small compartments with high bulkheads and

(*Concluded on page 123*)

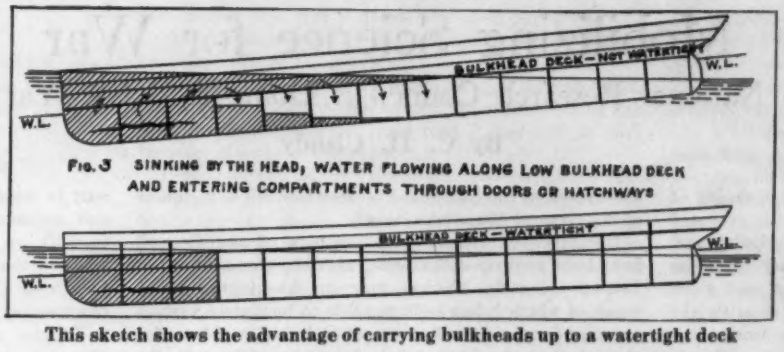


FIG. 3 SINKING BY THE HEAD; WATER FLOWING ALONG LOW BULKHEAD DECK AND ENTERING COMPARTMENTS THROUGH DOORS OR HATCHWAYS

This sketch shows the advantage of carrying bulkheads up to a watertight deck

Making Paper Tapes

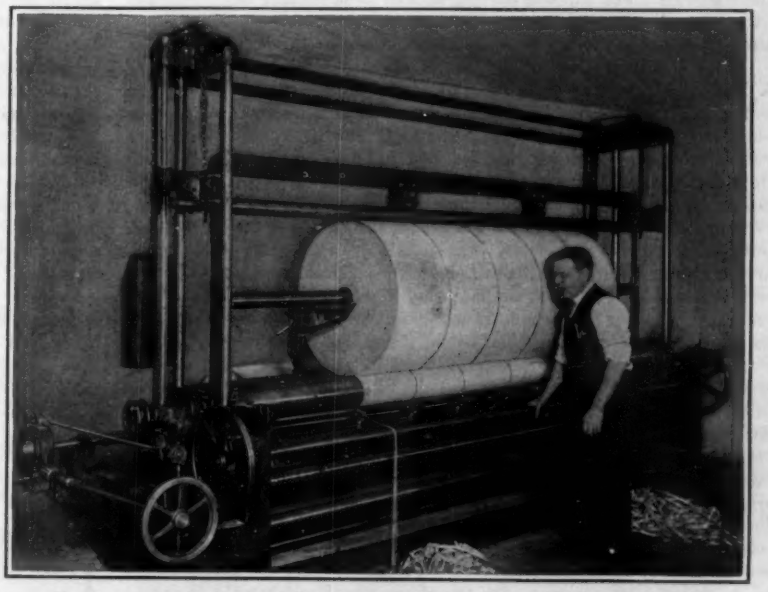
How the Wide Rolls from the Mills Are Converted into Narrow Coils by Automatic Machines

FEW who use adding machines, cash registers, wrapping machines, rolls of paper tape for sealing packages, or any of the thousand and one other devices which demand an accurately cut and wound roll of paper, of narrow width, ever stop to reflect upon the method of making such rolls. A moment's thought, however, will make it clear that the trick must be accomplished by cutting a wide roll into narrower sections; for the handling in unrolled form of any such shape as that of a ticker tape or a cash register roll, for instance, would clearly be quite out of the question.

Until a very recent date the process of making these rolls was of but little importance to the paper manufacturer; the bulk of the product of a mill was shipped out in sheet form, and for such paper as had to be put up in rolls any method at all was good enough. But with the enormously increased, and still increasing, consumption of this sort of article, the requirements for accurate, clean-cut strips of every conceivable width have been such that the processes of manufacturing these rolls call for more and more of the paper-maker's attention. The result has been the development of a series of slitting and rewinding machines which operate upon the general principle of unwinding a broad roll from one roller and rewinding it on another, cutting it continuously and automatically into a number of narrow widths as it passes some point between the two rollers. In these machines the slitting and rewinding processes cannot be regarded as separate and distinct from each other, but each must be considered in its relation to the other. Each process is supplemented by the other and both must work in harmony.

Broadly speaking, there have been used two methods of cutting, and two of rewinding. Perhaps the most natural of the latter is the so-called center rewind. This consists in leading adjacent strips alternately to two or more rewind shafts, which rotate by direct application of power and pull the paper around them into the desired roll. The method is open to the objection that the narrow coils will not stand alone after they are built up to any considerable diameter, and that they require constant attention to prevent their rolling up out of center, like a crooked window shade. Further trouble arises from variation in thickness of the paper across the width of the sheet. The rolls build up largest where the paper is thickest; and since the shaft speed is constant, the circumferential speed becomes greater at these points and pulls the strip askew.

The remedy for all this is found in the use of the surface rewind, shown in our cut. The paper is unrolled off the reel which is just visible in the rear of the machine; it is cut as it passes over the small roller in front, and rewound for the shaft directly above this. The strips are not separated as they are cut, but are led, all together, to the single rewind shaft, upon which they are rolled side by side in close contact. The power is applied, not to the center shaft of the rewound roll, but to the roller about which the paper passes on its way to this shaft, and likewise to the similar but smaller roller at the top of the rewound roll. The rewinding proceeds by virtue of the pressure of these rollers against the surface of the rewound roll; and it will be readily seen that the contact between the adjacent strips, and the uniform pressure across the entire face of the rewound roll suppresses any tendency of the paper to run crooked or to wind larger at any point along the roll and so forces smooth and uniform winding. As the rewound roll gets fatter and fatter, its center shaft slides up the side columns, and the upper control roller does likewise, with its counter-weights and chains.



Cutting a standard roll of paper into smaller rolls as it is rewound upon a fresh spindle

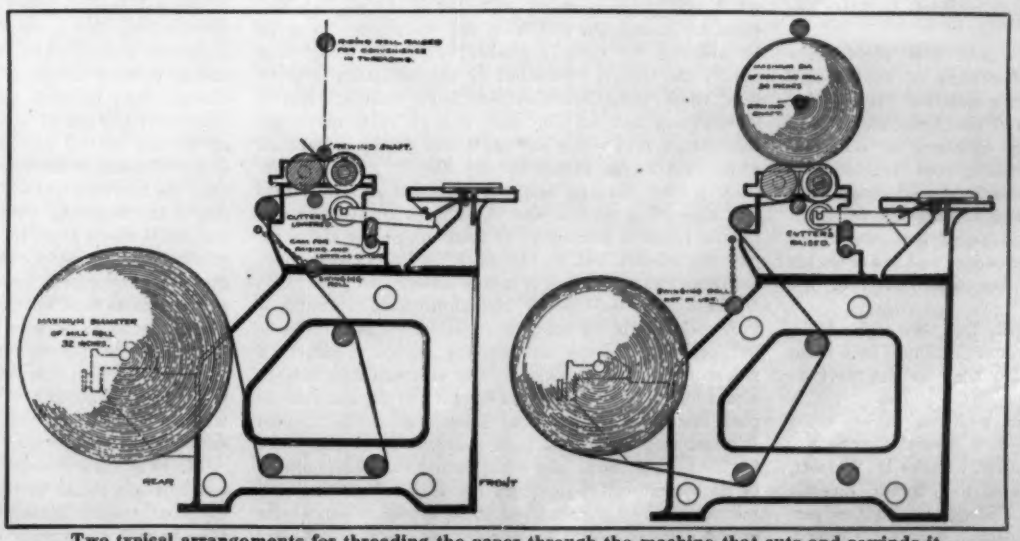
Attention is called to the very neat arrangement by which the primary and secondary gear wheels of the upper control shaft slide up and down a channeled and a plain column, respectively, so that in all positions they take their motion from the channeled column without any shift of contact. This device is a standard one, but one with which many of our readers are perhaps unacquainted.

With this method of rewinding great care has to be exercised in the slitting. Formerly this was not the case; an adding machine will work, even if the sides of its roll are rough. So the cutting was done by means of rotary shears; and while in the very nature of things the edge of this tool becomes slightly dulled after very moderate use, no damage was done. But with the surface rewind, a very slight degree of raggedness or fraying of the cut edges is quite sufficient to cause the adjacent strips to mesh together as they rewind. Under these circumstances it is often impossible to separate the coils. And even when the cut is made cleanly, the tendency of a shear blade is to stretch and pucker the cut edge slightly. Distorted and incapable of lying flat in side-by-side position, the strips then go forward to the rewinding somewhat overlapped, so that the two coils become firmly knit together and form a solid mass which cannot be separated into its parts.

It may therefore, be conceded that shear slitting will not work in connection with the surface rewind. Convinced that the latter involved advantages which could not be sacrificed, the designers of the machine which we illustrate asked themselves what manner of slitting could be devised that would be effective in connection with the surface rewind. The answer, they have found, is the score cutter. Not only is this applicable to fabrics of all kinds—fiber, asbestos, celluloid, foil and compositions—but its maximum efficiency is developed in connection with the surface rewind.

The score cutter consists of a single cutting or scoring disc with a V-edge, revolving under spring pressure in contact with the material as the latter passes about the polished surface of a steel cylinder as hard and smooth as glass. These cutting wheels are of high-speed steel, practically indestructible. Having the blunt edge of a cold chisel instead of the keen knife-edge, the problem of maintaining them in working order is vastly simplified. Mounted on ball-bearing centers, they revolve with a minimum of friction, and cleave the goods at the point of contact with a clean, even cut. The speed of operation is unlimited. As the illustration suggests, any number of cutters may be used, and with any desired spacing or spacings from one half inch up. Single spacers and gang spacers simplify the manual work of laying out the blades in the proper positions and hold them in place once they are located.

One of the notable features of the machine is its flexibility. Single cutters can be removed and replaced without disturbing anything else; the rewind roller can be selected of any diameter from three-eighths inch up; the pressure of the winding rollers can be varied at will to give a tight or a loose coil. In fact, this combination of the score cutter and the surface winding has been clearly shown to assure ideal results and to make possible the attainment of the highest standards of work at maximum speed and with minimum of waste. The accompanying line drawings are of interest in that they show two arrangements for threading the paper through the machine. The first shows one of several ways to thread paper from mill roll to rewind shaft, while the second shows a method with the swinging roll not in use.



Two typical arrangements for threading the paper through the machine that cuts and rewinds it

Glass for Cooking Utensils

FROM time immemorial, cooking utensils have been made of pottery, because this was the only substance known that would withstand the heat of the baking oven and the rather rough handling of the kitchen, and that was in addition, cheap. Almost the same ingredients are used in making pottery as are used in making glass. In pottery, these ingredients are molded into forms and are simply baked at a temperature just high enough to melt a glaze on the outside surface; but, in glass, they are melted into a liquid at a high temperature and then molded by pouring or blowing into various shapes.

The common glass that we have always known is brittle, easily breakable, and never before has there been a glass produced that could be heated and suddenly cooled without breaking. But a new glass now being made at Corning, N.Y., is used for baking dishes and cooking utensils and can be handled quite as roughly as any crockery. Every housekeeper now can see what her puddings and pies look like on the inside. This glass is a chemical product, in that it has been produced solely by the ingenuity of the chemist in the compounding of the ingredients, and not by any method of tempering.

Mobilizing Science for War

What the National Research Council is Doing to Solve War Problems

By C. H. Claudy

WE are pretty well educated up to the meaning of "industrial preparedness." We have accepted the new doctrine that war is fought by industry and manufacturers and mobilization of material resources both before and after it is fought by men and guns. We have come to believe that the country with the longest purse, the greatest material resources, the cleverest schemes of making available for actual battle the material mined and manufactured, is the country which is some day going to sit at the head of the peace table. But we have little conception of the utilization of the resources of science in war.

It is not difficult to understand why the popular idea of what science may do in warfare is so meager. The man in the street makes little distinction between pure science and applied science, usually calling the latter "invention" which of course it isn't. We are not a scientifically minded people, and are rather inclined to poke gentle fun at the supposedly long-haired, wild-eyed "scientist" in a musty laboratory, delving into some abstruse subject, or the astronomer, with his eye to a tube, investigating the size and proportion of some star so far away we can't even imagine it.

"What's the good?" is the Americanese for *cui bono*, and too often applied to the investigations in pure science on which foundations rest the whole superstructure of applied science, modern inventions, manufacturing processes, our very civilization itself.

Unfortunately, the very nature of the work in the war which science is doing and has done, is such that its publication is inadvisable, if not impossible. If, for instance, some chemist discovers an explosive ten times as powerful as any known, and it is supplied to an army, it would be foolish to talk about it in advance. If it were possible to discover a method of making submarines sink themselves, to mention it would be to put the submarines on their guard. Hence, at least as far as present research and immediate past results are concerned, only the vaguest descriptive terms can be employed.

But even without detailed particulars, the mobilization of the resources of science in this country is of intense interest. It is doubtful if one reader in a thousand, outside the research laboratories of the United States, even knows there is such an organization as the National Research Council, still less that it is acting as the Department of Science and Research of the Council of National Defense, and devoting a very large amount of time and attention at present to war problems. Yet such is the fact—a statement which means that practically every research laboratory, whether maintained by industry or university, and practically every scientist, whether engaged in pure or applied science, in teaching or in actual laboratory work, is at the service of the United States, and to a large extent, now engaged in war work.

Owing to the foresight of the President, and the enthusiastic coöperation of the National Academy of Science, this mobilization of laboratories and scientists was an accomplished fact long before the United States was drawn into the war.

In April, 1916, after the attack on the "Sussex" had resulted in this country's demanding that submarine warfare cease, the President asked the National Academy of Sciences to organize the scientific resources of the United States so that they could assist in promoting national security. He desired the Academy to coördinate the scientific resources of the entire country and gain the coöperation of Governmental, educational, and industrial agencies, in which research facilities are available.

The National Research Council was accordingly organized with the active coöperation of the leading national scientific and engineering societies. It includes the chiefs of technical bureaus of the Army and Navy, heads of Government bureaus engaged in scientific research, and groups of investigators representing educational institutions, research foundations and representatives of industrial and engineering research. The representatives of the Government were appointed by the Presi lent, who promised and has given his cordial support and secured the coöperation of the Government Departments.

The Chairman of the Council, Dr. George E. Hale, who in private life is the Director of Mount Wilson Solar observatory, is giving his entire time to the work in Washington.

Dr. Robert A. Millikan, in addition to his other activities, serves as Chairman of a Special Committee, the other members of which are Dr. Charles D. Walcott, and Dr. S. W. Stratton, appointed to coöperate directly with the Council of National Defense on matters pertaining to the work of the National Research Council. Dr. Hale, Dr. Millikan and Dr. Marston Taylor Bogert also represent the National Research Council as members of the General Munitions Board.

Recently the Washington members of the Council have been actively coöperating with the members of the French Scientific Mission now in Washington, as a result of which it has been possible to formulate various agencies for the consideration of technical problems for the solution of which definite need has arisen at the battle front.

It is often stated that even as order comes out of chaos, so progress of civilization is advanced, not retarded, by war. That this will be so in the great world war seems obvious, especially when any clear comprehension of the work which science is doing is had. It is impossible for the reasons stated to go into minute details regarding the work of the National Research Council or its 31 committees, but the most casual glance at their labors shows what results affecting the onward march of civilization may confidently be expected when peace is declared.

The Physics Committee is engaged in an exhaustive study for detecting submerged submarines and mines, in studying and devising range-finders of various types and instruments for the discovery of invisible aircraft and sapping parties, as well as in making improvements in wireless and other instruments used in the air.

Many of the submarine menace prevention problems are such as to require the most abstruse scientific investigations. One such plan or scheme laid before the Physics Committee involved a principle of physics soluble by mathematics. The Physics Committee summoned the best men in the country, the scientists who knew most about the pehenomena involved, and gave them time and place to work out the problem. At the end of a few weeks the theory of the suggestion was completely analyzed, and an accurate basis established on which to begin experimental work.

Of course the National Research Council is not working independently but in the closest coöperation with the Navy, which has recently established a Special Board to coördinate and organize all problems relating to submarine warfare. The general plan adopted by the Navy Department contemplates the closest possible coöperation between the Navy Department Bureaus, Navy Department Boards, Naval Consulting Board, and the National Research Council. A group of 40 leading physicists, convened by the National Research Council for an exhaustive discussion of submarine problems with the members of the French Scientific Mission, is now represented at a submarine base by a committee coöperating with the above mentioned Special Board in tests and investigations of various devices for submarine offense and defense. Many physical laboratories are also taking part in this work, testing in practice the devices which theory and analysis show to be theoretically possible.

It is a pity that those members of Congress who doubt the patriotism of the American business man, because, in the natural course of his business he is often in a position to make a fair profit from the Government, cannot be led to consider the coöperation which big business is giving the National Research Council.

The greatest research laboratories, outside those of the Universities, are maintained by some of the large manufacturing establishments. Several of these have not only offered their services, but have turned over whole staffs of experts, as well as the most complete of laboratory equipments, to the work of the Council. Unquestionably, if—perhaps it is better to say when—concrete results are had from the work done in these laboratories by these scientists, who are being paid not by the United States but by the industries in question, those industries may reap some benefit. But it is anything but certain that out of such investigations, there may result any particular device or method which will be profitable to any one to make or sell. Only a very cunning and warped mind can read into this willingness on the part of industry, university and private research laboratory to lend equipment and men, pay the salaries and do the work for the Government, anything but patriotism of a high order.

The work of the Council, though involving so much of pure science, is thoroughly practical. The difference between pure science and applied science is largely if not entirely, one of motive. The pure scientist attacks a problem to find the answer for love of the answer—to push back the frontiers of knowledge. The applied scientist may attack the same problem in the same way for the sake of the answer—but to find the result because of its commercial value. All the work of all the committees of the Council, even those made up entirely or almost entirely of men whose work has lain in the domain of pure science, is at present of the applied variety. And in laboratory after laboratory, at submarine bases and aeronautical stations, are groups of scientists set to work by the National Research Council to bring to bear on the problems of modern war the accumulated knowledge of every laboratory and every brain which can possibly further their solution.

To sum up its work in a few words, the National Research Council can be considered as a clearing house for scientists, a mobilizing office for scientific facilities. It provides the short cut between the man who knows the problem and the men who may find the answer. It has made a solid unit out of the laboratory and research facilities of the country and provided itself with such complete information that there is practically no question which army or navy can ask of science that it cannot supply the best man, the best equipment, to attempt to find the answer.

It is an axiom that no natural phenomenon is an exception to a natural law. If it exists, it operates because of a law. If the law science recognizes doesn't square with the phenomena, then the statement of the law is wrong. Consequently, science recognizes, now, no unsolvable problems. A learned man once asserted publicly that in the very nature of things it was impossible for man ever to learn the composition of the stars and sun because he couldn't get to them. Along came Kirchhoff and the spectroscope and taught us that the information was available any time there was a cloudless sky. Hence, the submarine problem, the detection of invisible air craft, the complete elimination of disease, the cure for any epidemic, the protection of the living machine against poisonous gases, the manufacture of a substitute for rubber or for gasoline, are not, scientifically considered, either impossibilities or even improbabilities—they are merely problems of which the answer is to be found—if one only goes about it the right way.

It is in this spirit, and with this thought, that the National Research Council is doing its work. It will be by that spirit and by the efforts of the men who hold that faith, that this country, through its enormous resources of apparatus and of men, will not only solve many of the problems which war has made pressing, but will do much—incalculably much—to the furtherance of civilization, the promotion of industry, the improvement of modern life, when its solution of these pressing questions are turned from the arena of war to the paths of peace.

Science in the Fisheries Industries

IT is of great interest to explore the sea bottom in order to observe the biological conditions which prevail in various regions, but the usual methods of dredging for specimens are as yet very imperfect in this respect. In the line of progress is a recent apparatus devised by a Danish scientist, M. John Petersen, for capturing animal specimens, and it is claimed to allow of a much better exploration of the sea bottom for estimating the density of animal life. The author shows that in each of the regions explored there exists a grouping of animal species in a veritable community, in which one characteristic species is seen to predominate. For instance in the region lying to the north of the Kattegat at depths of bottom up to 35 feet, he finds that the characteristic species is a sea urchin, while between 80 and 160 feet, it is a gasteropod *Turritella terebra*. It is also noticed that different animal species predominate at various seasons of the year.

This idea of a predominant species is not a new one in general, for it is the basis of the theory of vegetable associations, and Germain brings out the fact of predominant species which characterize large areas of land, and in geology the same idea is involved in the case of characteristic fossils in various strata. While the above considerations are of a scientific order, the exploration of the sea bottom also leads to conclusions of a great practical value in the fisheries industries. It is observed that the nutritive value of the sea bottom varies according to the localities, the most interesting of these being the places where there are great numbers of small animals which multiply rapidly and disappear in the same way, giving rise to a large production of organic matter, and this serves as food for the large fish. It is therefore of great interest as regards fisheries, to find the amount of production of nutritive matter such as is required for certain fish which it is desired to introduce upon a stated region of sea bottom. This is quite analogous to the way in which the farmer selects ground which is best suited for various crops.

M. Petersen's researches were very actively carried out during a recent period and have already given some excellent results in this direction. Sea resources can thus be cultivated with the view of securing maximum output in the same way as in the cultivation of the soil.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

Premature Explosion of Shells

To the Editor of the SCIENTIFIC AMERICAN:

Opportune and pertinent are the questions asked by Noel Deisch in his letter, under the above title, published in your issue of July 28th.

If your correspondent would take the trouble to investigate he would find the answer to those questions in the fact that many, perhaps most, of those in high places on our Munitions Boards, Naval or Military, either in executive or advisory capacity, are themselves either inventors or the proprietors of the inventions of other people, or are directors in those corporations engaged in the manufacture of guns, projectiles, explosives or kindred elements of warfare.

To recognize and adopt any new invention, however superior to those in present use, would not only relegate to "innocuous desuetude" those elements now being manufactured at great profit, but would necessitate, in many cases, alterations in the machinery of their manufacture, involving expense and a possible disarrangement of intervals between fat dividends.

Expert knowledge of those matters is rarely disinterested, and disinterested experts are still more rarely found on "Boards" under our system.

One is reminded of Macaulay's angry declaration as the result of his own experience: "Boards are long and narrow. They are also wooden."

W. S. CRANE.

Randolph, Vt.

The North Sea Mine Barrier

To the Editor of the SCIENTIFIC AMERICAN:

I have been giving very serious thought to your plan for stretching a barrier across the North Sea from the Shetland Islands to the coast of Norway, which plan you so ably presented in the SCIENTIFIC AMERICAN of May 19th. It seems to me to be the most obvious necessity at the present time.

There has been so much done that is new and strange in the present war and with such excellent results as practically to revolutionize our old ideas of warfare. Warfare is no longer a hard and fast method of procedure under fixed rules laid down in books of military tactics and strategy. It has become a vast engineering problem and industrial problem—a vast economic and financial problem. It is a problem which should have the benefit of the ideas, knowledge and experience of the ablest men in the nation, and above all, the inventors and engineers.

Fossiliferous conservatism must yield to daring and adventurous creative imagination, and your North Sea barrier is a very good example of the value of such imagination.

The "Monitor" and the "Merrimac" were both products of such imagination. The great field howitzers of the Germans were imagined and their utility foreseen by others besides the Germans, but their use in the present war is due to German initiative.

It is my opinion that if the Central Powers were in the position of the Entente Powers and were suffering as are the Entente Powers from enemy submarines, the Germans would not long delay in placing that barrier across the North Sea.

It was one of the wisest sayings of Napoleon that in order to conclude matters in war it was necessary to restrict the movements of the enemy in every way and to come to close quarters.

There is an open gateway three miles wide off the coast of Norway through which submarines may freely travel back and forth without interruption. That gate should be closed, and it is my opinion that it must be closed if this war is to be won. More, it must be closed or the war will, in my opinion, be lost.

There is absolutely nothing to prevent the construction of such a barrier. Of course, every such problem has its attendant problems to be solved, but there can be no very serious problem to be overcome—nothing at all comparable to the boring of the Mont Cenis Tunnel, the building of the Panama Canal, or even the building of the Quebec Bridge, while the potential value of such a barrier, as compared with the potential value of one of these other enterprises, is beyond conception.

The building of the great Chinese Wall to keep out the Tartars was certainly a greater task than the building of such a barrier, and that task was accomplished by Chinamen centuries upon centuries ago.

There are methods of anchoring cables for holding the net which take a clincher hold upon the sea-bottom and which would hold more than the cables would stand.

Floats could be placed at intervals along the entire length of the anchoring cables for their buoyancy. The mesh of the net would be so large that sea-weed could not clog it up, and it could be made so strong and anchored so firmly that it would be able to stand the most turbulent sea.

Bombs could be placed at intervals upon the net, which would act to destroy any submarine which should run into it. No submarine could ram it and cut its way through it without destruction.

Bombs for such a net may be made so insensitive that when one bomb explodes it will not set off a neighboring bomb due to shock transmitted through the water. Bombs of sufficient size to destroy a submarine and made to go off on contact with a submarine could be suspended in the net and hung at different depths below the net. Also submarine mines could be planted at required intervals under the net to prevent any submarine from diving beneath the net.

It is curious that the neutrality of Norway should be raised as an objection to the employment of such a barrier. It is also very strange that it has not yet been universally recognized that there are no longer any neutral countries. Neutrality in this great world war is impossible. It is a war between autocracy and free institutions, monarchy and democracy, humanity and barbarous domination. The welfare of the people of Norway and the people of every so-called neutral nation at the present time is as vitally at stake as the welfare of the people of those countries actually at war with Germany. If Germany wins this war, there will not long be any Norway or any Sweden. The northern frontier of Germany will be moved up under the Midnight Sun.

I congratulate you and congratulate the SCIENTIFIC AMERICAN for your advocacy of this vital measure.

HUDSON MAXIM.

The Strategic Use of Progress

To the Editor of the SCIENTIFIC AMERICAN:

It is a surprising fact that none of the nations at war seems to have awakened to the great truth that progress and innovation are distinct factors of warfare, to which the commonest military axioms apply.

Progress or change in warfare, which comprises technical improvements in material or tactics of combat, is subject to the same fundamental principles governing its successful use, as are the other factors of fighting.

What general would allow his men to assault a fortified trench, one man following another? First a half dozen from one regiment, then a dozen from another, then a lone individual from another place, and so on, expecting to send more and more and more until finally the stream would reach the trench and capture it. That would be nothing but butchery? True: but that is the way both sides in this war have used each and every improved implement of attack.

First, a single isolated try-out. Then a gradual extension of use, and then use on more or less of the whole line.

The result? The defense has been developed just about as rapidly as the offensive. So that today they both use, and win little by their use, weapons that if used suddenly on the whole front almost surely would have given a decisive victory.

There is a period, either long or short, in the use of any new device or theory, in which it is, to a degree, supreme, no effective counter improvement having been developed. Though that period may be short in time, thus limiting the effective use of the improvement, the results realized are more dependent on the extent of the application of the improvement, during that time, than on the mere length of the period.

Before examining specific instances of the failure to apply the correct procedure, let us look at the only instance that I know of where it was applied.

When the Germans invaded Belgium they had guns that would blow up the best defenses on earth at that time. What is more important they had enough of them, so that the forts of Belgium were almost a source of weakness rather than of strength. Now if they had had only, say, one or two such guns as an experiment, found them a success, and then made more, where would the front be now? It is easy to see that the defensive could have been improved, as it has been, in time to have stopped them far, far nearer the frontier than they are now.

If you doubt it, turn to Zeppelins. How effective were the defenses of London, against the first raid? Yet now "Zepp's" apparently have been abandoned because of the effectiveness of the improved defenses.

One of the best examples of the way an improvement should not be introduced is the use of gas by the Germans. First they made a little experimental attack and then gradually used it more and more. As a direct result of this method the French and English were equipped with helmets, and able to stand any amount of gas, before the time came when the Germans used enough to have any chance of success. If Germany had supplied her own troops with helmets and had accumulated enough gas supplies to have attacked the whole front with gas the first time, the chances are they would have almost annihilated their foes.

The same course was pursued with liquid fire, with the same results, and both sides have likewise thrown away tremendous advantages from their misuse of aeroplanes.

The biggest mistake of Germany however, is in her *gradual* adoption of the submarine. If she had used the submersible against warships only, until she had a vast fleet, perhaps a thousand or more, at least enough to surround England completely, and then had suddenly loosed them on the merchant ships, they would have had helpless victims, unprotected by nets and "swatters." At the least, England would have been practically eliminated from active campaigning. Perhaps this would have won the war for Germany.

Now we also are in the war, cannot we see the point and whenever we have a new device, hold it in reserve until we can use it in a mass attack?

If it is necessary actually to fight with it in order to find its best development, let our own men have sham *even real battles* among themselves. A few martyrs had better be sacrificed than to lose the benefit of the surprise element in the use of any new device. Above everything don't, don't, put it into use a little at a time and in that way let the enemy perfect his defense against it.

Another thing in favor of trying it between our own men: the defense against any new form of attack should be developed by the side first using it, if at all possible, before revealing the idea, by use, to the enemy. Otherwise you may be beaten by your own ideas.

Is it possible that Germany has at last realized the possibilities of this plan and that she is accumulating a reserve of U-boats? If so, "Where do we get off?"

PERLEY A. HILLIARD.

Haverhill, Mass.

Give Up the Atlantic to the Submarine

To the Editor of the SCIENTIFIC AMERICAN:

Block the Straits of Gibraltar with a net. The distance is 10 miles.

Block the Straits of Otranto, the heel of Italy. The distance is 40 miles.

Block the Dardanelles. By doing this we will make the Mediterranean as safe as Lake Michigan.

Turn every pound of freight westward to the Pacific Coast. Send all Allied ships through the canal to the ports of San Diego, Los Angeles, San Francisco, Oakland, Portland, Tacoma, Seattle and Vancouver.

Put the railroads in shape to handle the traffic.

Stop the building of useless wooden boats. Put some of that appropriation into freight cars and locomotives. The former, *we know*, we can build by the mile from green timber. Then we can go ahead with the sensible project of steel ships.

Make provision for coaling at Nagasaki, Singapore, Colombo and Aden. Yes, the distance is longer but the U-boat has proven to us that the longest way around is the shortest way home. The consumer pays the freight. England will object, but not if she reasons this method will save her from possible hunger and defeat.

Japan will naturally furnish her great merchant marine, and with no future losses our steel plants can turn their attention to munitions and guns.

Freight can be landed in France and transshipped across country to Calais, thence to Dover.

Is it not wiser to be absolutely sure that you are going to deliver food to England in 90 days than to have it sunk?

Don't let the influence of Eastern owners of docking and lighterage interests stand in the way of this plan.

Discount the wild reports of German submarines capable of operation in the Indian Ocean.

Sixty miles of net, which can be placed in 90 days, will win the war.

WASHINGTON B. VANDERLIP.

New York, N. Y.

Sisal Not a Cactus

To the Editor of the SCIENTIFIC AMERICAN:

In the article, "How Rope Is Made," published in your issue of July 7th, we read: "Sisal, the sword-like leaves of the Mexican cactus. . . ."

The plant from which sisal is woven belongs to the amaryllidaceous genus, Agave, and botanically, is far removed from the order Cataceae.

A SUBSCRIBER.

[Our correspondent is of course correct. It is very easy to understand how the contributor of this article, an industrial rather than a botanical authority, should have fallen into this quite common error of attributing everything with spines to the cactus tribe. The editor regrets that the misnomer should have escaped his notice.—THE EDITOR.]

An Omission

IN the article on "The Potash Call," appearing in the SCIENTIFIC AMERICAN of July 28th, reference was made to a process of producing potash from felspar and the invention was credited to Prof. J. P. W. Frazer and Dr. E. Miller. Dr. Miller has just called our attention to the fact that Dr. W. W. Holland is also one of the inventors of this process.

A 7000-Horse-power Electric Locomotive

A Preliminary to Electrification in the Alleghany Mountains

By William H. Easton

FORESEEING that at some time in the future the continually increasing demands for haulage over its main line will be greater than the present capacity of its tracks, the Pennsylvania Railroad is making arrangements to anticipate trouble, so that when the time comes it will be prepared to handle a greatly enlarged volume of traffic.

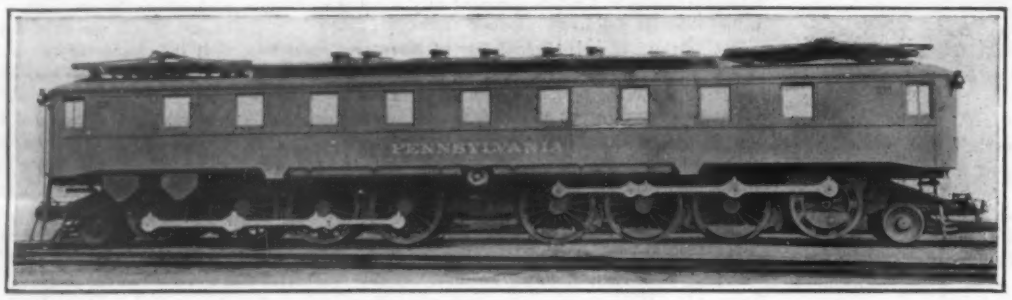
The capacity of a railroad does not, of course, depend upon the average capacity of its roadbed, but upon the capacity of the most restricted points along the line, such as terminals, steep grades where speeds are necessarily low, and long tunnels and bridges which can not be widened except at enormous expense.

Two such restricted points exist on the important main line of the Pennsylvania between Philadelphia and Pittsburgh. One is at Broad Street Station, where hundreds of through and suburban trains pass in and out every day; and the other is the division between Johnstown and Altoona, where the road crosses the Alleghany Mountains, going up heavy grades in either direction, running through a long tunnel, and passing around the famous Horseshoe Curve.

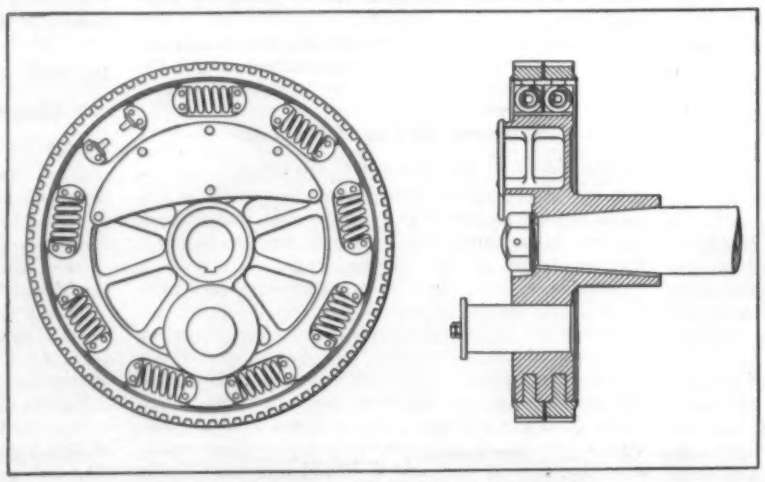
The railroad solved its problem at Broad Street Station by electrifying its suburban trains. Under steam operation, the following car movements must take place at this station in order to make up an outgoing train from an incoming one: 1. Train in; 2. Switching engine in; 3. Cars out; 4. Engine out; 5. Cars in; 6. Switching engine out; 7. Engine in; 8. Train out. But with electric trains there are but two movements: 1. Train in; 2. Train out. Thus with the electric trains the use of the tracks in and around the station is greatly reduced and the result is the doubling of the station's capacity.

And the same agent—electricity—will be the means for preventing future congestion in the mountain division, because trains that three of the largest steam locomotives can now barely move will be rushed by electric locomotives up the grades at 20 miles an hour. In this way the amount of freight hauled over this division will be greatly increased, and all danger of congestion here will be removed for many years to come.

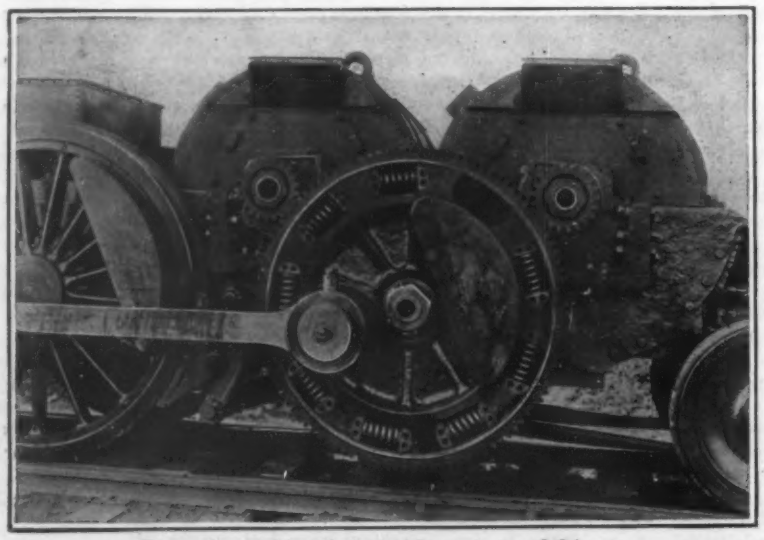
Though the electrification of this division will not take place for some time yet, the Pennsylvania Railroad has taken the first step in that direction; namely, the construction of an electric locomotive as a standard from which many others will be built for use over this division. This locomotive is remarkable in several respects. Its capacity is 7,000 horse-power which is 50 per cent greater than any other locomotive now in existence. In appearance it resembles an ordinary steel baggage car, but is very much larger, being over 76 feet long, weighing 240 tons, and having wheels six feet in diameter. It consists of a single unit, instead of two separate and independent halves, which has been the practice heretofore in large electric locomotives.



This is an electric locomotive, not a car



Construction details of the spring drive wheels



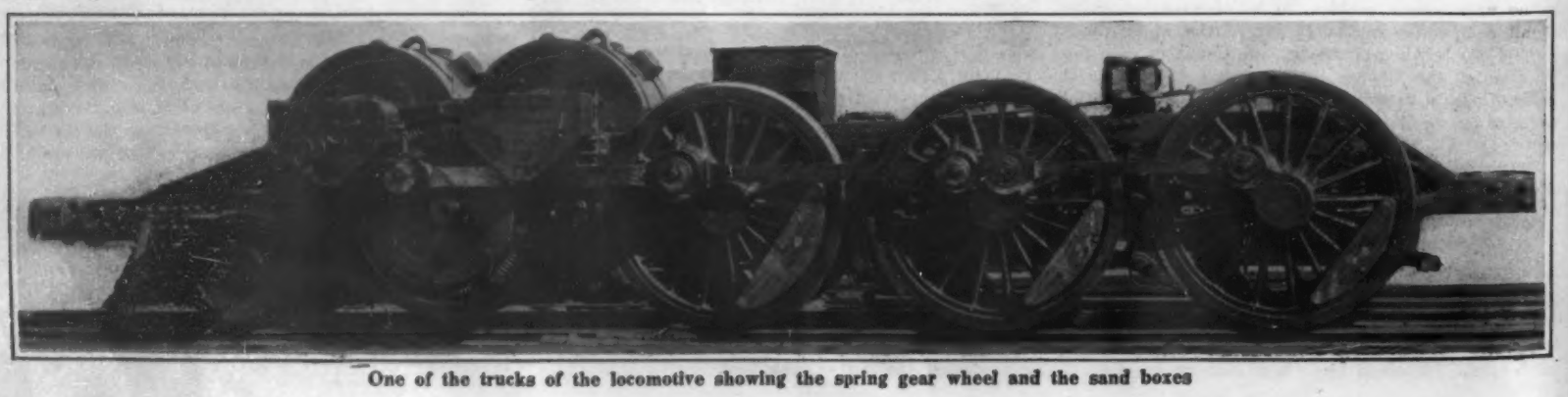
The spring cushions between the motors and drivers

The locomotive has two trucks, and each truck has six driving wheels and two motors. The motors drive a gear wheel on each side of the truck and this in turn drives the wheels by means of the usual side rods. It will be noticed that each gear wheel contains a set of springs. The purpose of these springs is to act as a cushion between the motors and the drivers. The huge mass of the train naturally cannot be started at the instant the motors start and if the connection between the motors and drivers were rigid, great stresses would be set up in the driving mechanism. The springs, by yielding when the turning force of the motors is applied, ease off these stresses and prevent damage. The operating current is to be 11,000 volt, single-phase alternating current which will be supplied to the locomotive from a trolley wire. This kind of current is the most economical for distribution over long distances and is therefore especially suited for railroad operation. Single-phase motors, however, are not as serviceable as three-phase motors for heavy freight haulage, because the latter are very simple and rugged in construction, have no commutators, and can be stalled for a considerable period of time with the full current on without injury. Hence the system that has proved so successful on the electrified zone of the Norfolk and Western Railroad (described in the SCIENTIFIC AMERICAN SUPPLEMENT of January 15th, 1916) will be used on the Horseshoe Curve electrification. In this system the high voltage single-phase current received on the locomotive first passes through transformers which lower the voltage and then through a phase-converter, which converts it into three-phase current for use in the motors. In this way, economical distribution and satisfactory operating characteristics are both obtained.

Two running speeds without the use of resistance in the motor circuits are available; a slow speed of 10 miles an hour, by connecting the motors in cascade; and a road speed of 20 miles an hour, by connecting all four motors in parallel. Intermediate speeds are obtained by varying the secondary resistance of the motors by means of a water rheostat. So carefully has this control been designed that the locomotive with the heaviest train can be started and brought up to full speed in about two minutes without jerking or slipping the wheels. The locomotive can be controlled from either end.

Twenty miles an hour is the highest speed of the locomotive when taking power from the line and it is also the maximum possible speed when coasting down hill. This restriction in speed is due to the fact that when the locomotive is coasting the motors become generators and return power to the line and are then subjected to a strong braking action. As a result of this so-called "regenerative" braking, trains can come down hill under perfect control without the use of air-brakes, which are held in reserve for emergencies and for making full stops. This adds greatly to the safety and ease of operation of the trains, saves a great deal of wear and tear on brake shoes and wheels, and permits higher average speeds down grades.

This locomotive is at present in temporary service on the Philadelphia-Paoli line of the Pennsylvania Railroad. Later, it will probably be transferred to the Norfolk & Western Railroad where it will meet conditions of grade and service that are similar to those found on the Alleghany Mountain division where the locomotives of this type will ultimately be used. Here it will receive a most thorough test in actual service.



One of the trucks of the locomotive showing the spring gear wheel and the sand boxes

If these were shells the field would be under guard

In the absence of desiccating plants many farmers utilize the sun to dry their fruit. It is, however, a cumbersome process and only practicable where labor is cheap and capital dear

America Faces A War Tragedy

How Are Our Bumper Crops of Perishable Vegetables To Be Conserved and Brought to the Consumer?

By H. C. Hardy

THE horrors of war are not all in the trenches. The sacrifices of war are not all of blood, of health, of strength of body and straightness of limb. For every soldier in a trench five men must labor to feed, clothe, support and supply him with what he needs. Men who risk their all for patriotism, who heed the impassioned appeal of their government, have a right to demand that their government fail them not when their need comes.

Will the United States Government permit a useless, criminal sacrifice of food, of labor, of money and courage and patriotism from its people, because of lack of appreciation of the need of speed when perishable food must be harvested and stored or allowed to rot and freeze?

Here is the story:

In his April 15th war message to the American people, President Wilson emphasized the need of preparedness, cooperation and patriotism on the part of the tillers of the soil in no uncertain terms. He wrote:

"Upon the farmers of this country—in large measure rests the fate of the war and the fate of the nations. May the Nation not count upon them to omit no step that all increase the production of their land?"

As the Secretary of the Interior has jurisdiction over the Reclamation Service, and therefore, an intimate relationship with every man who is enjoying the fruits of the vast work the Government has done in turning water unto the desert and the desert into a paradise, Franklin K. Lane added his powerful appeal to that of the President. He said, a few days later:

"Project people, do you realize that there are 700,000 acres of land on our projects for which reservoirs are built, ditches dug, and water ready, which have not yet been tilled? Do you realize that this area, if put into crop, would add $15,000,000 worth of food in a single year? Loyalty and partiotism as well as economic necessity, demand that you get busy and put this land into food crops this year and next. The United States can not perform her just function in the world crisis in which we are now precipitated unless our farmers do their full duty. These 700,000 acres should be supporting 20,000 families this year, as well as supplying food for an army division at the front. Here is a great opportunity for our citizens to render assistance. These lands are not public lands. They belong to private owners, and if they do not utilize their property, the time may not be far off when our national needs will require confiscation and Government cultivation. No one is entitled to what he does not use."

Through the multitudinous channels of publicity open to the Department of Agriculture, Secretary Houston added the weight of his voice to these appeals. In no uncertain tones he called upon the farmers of the nation for patriotic service, mentioned the probability of high prices as an additional inducement, and closed his message with this statement:

"The duty of the individual farmer at this time is to increase his production, particularly of food crops. If he has control of tillable land not in use, or money lying idle, or labor unemployed, he should extend his operations so as to employ those resources to the fullest extent. This does not mean that he should rob his land, waste his capital, or expend his labor fruitlessly, but that by wise planning and earnest effort he should turn out a greater quantity of food crops than ever before. He will not lose by it, and he will perform an important service in supporting his country in the task that lies before it."

But the Government did not stop with printed appeals, with the scatterings broadcast, of messages from authority. Where possible, the appeal to a patriotic planting was carried personally. Secretary Lane appointed a special committee, consisting of the Hon. Ellwood Mead, professor of Engineering in Berkeley University, Cal., Mr. I. D. O'Donnell, Superintendent of Irrigation and Mr. C. J. Blanchard, Statistician, both of the Reclamation Service, the labors of which were to be directed to speeding up production, increasing acreage under cultivation and a greater and more intensive effort for larger crops.

The response was instant, and encouraging. Whether you ask him to shoulder a gun and fight in a trench or shoulder a hoe and fight in the field, the American farmer is a patriot. All over the country the word was taken up; farmers' organisations spread it, municipal organisations carried it, and farmers acted upon it. So great, indeed, has been the response that no one knows just how great it is, as a whole.

But they know in the Reclamation Service what the response on the Reclamtaion Projects has been. Last year there were 856,000 reclaimed acres under cultivation. *This year 150,000 acres in addition have been tilled, sown, and should shortly be harvested.*

It is so easy to write the figures, so simple to read them, it is difficult to realize what they mean. But go to any farmer, anywhere, late in April, when his plans are all made, his seed bought, his labor planned, and tell him you must have a 17.5 per cent increased planting, and see what an answer you get.

The Reclamation farmers made the natural answer: "We can't do it. Where are we to get the seed? How shall we finance the increased labor? How can we till and plant and harvest more, when we are already doing all we can?"

The three committeemen told the Project people how. Working through State Councils of Defense, money was raised and seed bought, in the centers where it was stored. Local communities were interested and Boards of Trade, Chambers of Commerce, the Water Users' Associations, Bankers' Associations, coöperated in raising and setting aside funds to aid farmers who had already shouldered their burdens, to add to their load. Meetings were called,

(Continued on page 123)

When the Reclamation Service loaned tractors did it not imply that the crops would be used by the Government or for the people?

Waste of ammunition is an army crime. Who is responsible for the waste of this ammunition?

A Chair for the Worker

ONE of the most important studies now occupying the attention of industrial engineers is the investigation of fatigue in all lines of human effort, with the object of eliminating all useless work and strain of the highly complex human organism. This is not a humanitarian movement any more than the elimination of friction in a machine is actuated by any benevolent regard for the mechanism. But it is found to pay as a good, hard business proposition to prevent weariness and exhaustion. Of course, this redounds to the comfort and happiness of the worker.

Operator's chair mounted on wheels

The chair swung away to let the operator stand

Careful studies have been made of rest periods and their effect upon workers and the subject is gradually being reduced to an exact science. The study calls for coöperation on the part of employers, and in order to focus public attention upon the matter, the first Monday of December has been set apart as a Day for the Elimination of Unnecessary Fatigue.

Not least among the factors bearing upon the situation is the posture of the worker. It has been found for instance, that production can be increased by supplying the workers with chairs of different types adapted to the task in hand. It is also found a great relief to the worker to be able to spend part of his time standing and part sitting.

We are wont to think of a chair as being adapted for stationary work only, but the accompanying pictures illustrate a chair which can be used even with a task that requires an operator to move from side to side. The chair is mounted on wheels that travel on a track. A foot-rest is furnished which may be set to suit the convenience of the worker. With a slight push the chair may be rolled to one side or the other. The track is swivelled on one of the two supporting posts, so that when the operator wishes to stand the track, chair and all, is swung out of the way.

A chair such as this would also enable a legless or one-legged cripple to operate machines which have heretofore required workers possessed of all their members.

A Hammer That Pulls as Well as It Pushes

THE contractor in charge of certain work on the new 1,000-foot pier in New York recently had quite a little job of pile-pulling to perform and no apparatus of recognised pulling proclivities to do it with. So he exercised his ingenuity and made his steam hammer do the work, as shown in the accompanying cut.

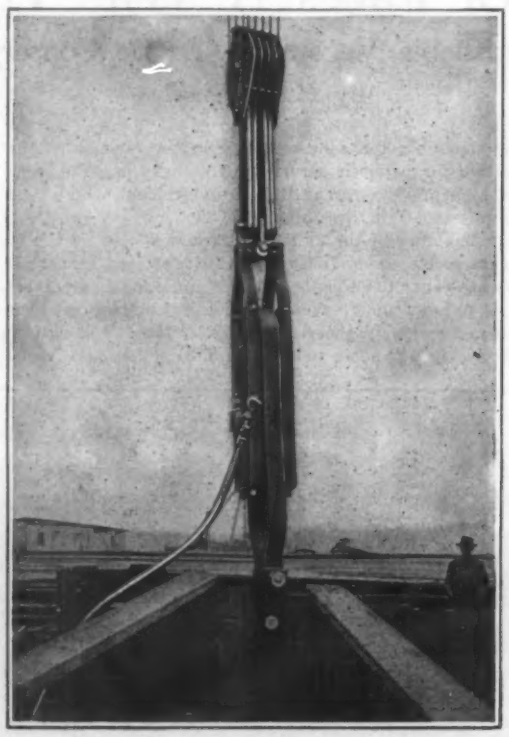
The procedure was simplicity itself—so simple that it would seem as though it must have been thought of elsewhere before. However, we have not met it, so we set it forth for the edification of our readers. The hammer was merely hooked up to one of the big steel sheet-piles, as shown in the picture, and the engine induced to give a bit more of a heave than in lifting the hammer free for a stroke; and up came the pile.

A Car Pusher Which Takes the Place of a Locomotive

IT is unnecessary to have a special locomotive or to call on the railroad for its engine in order to move a loaded car to any desired position in a large industrial plant, if use is made of a device shown in the illustration. The expeditious handling and quick-unloading of freight cars today is a most important factor in industrial war mobilization, particularly in handling iron ore at the docks. A new type of car pusher for the purpose of speeding up the unloading of cargoes and cars and eliminating the necessity of the use of a switch engine is shown in the illustration.

The machine has a rigid frame supported on four single flange track wheels operating on a 41½-inch gage track. The pusher is propelled by a single cable which runs between the rails the full length of the dock, a distance of 425 feet. The cable is securely anchored to concrete foundations at both ends through a spring tension device, which keeps it taut. It runs around and is attached to two differential drums mounted on the frame of the car pusher, and by starting the 40-horse-power 220-volt direct-current motor to which they are geared, the machine is propelled along the track. A powerful brake is located on the motor armature. The direction of travel is changed by reversing the motor. Each machine has a drawbar pull of 8,000 pounds and a speed of 100 feet per minute. Power is obtained from two lines of protected conductor bars running between the rails. The pusher is provided with a broad steel arm located at the front end of the cab, as shown. This arm can be thrust out on either side by a handwheel located in the cab. When in this position it strikes the end sill of the railroad car and pushes it along.

The pusher is 26 feet in length over all and has a wheelbase of 16½ feet. When operating between railroad tracks laid on 14-foot centers there is a clearance of five inches between the machine and the largest steel hopper cars on either side of it.



Pulling giant "tacks" with a steam-hammer

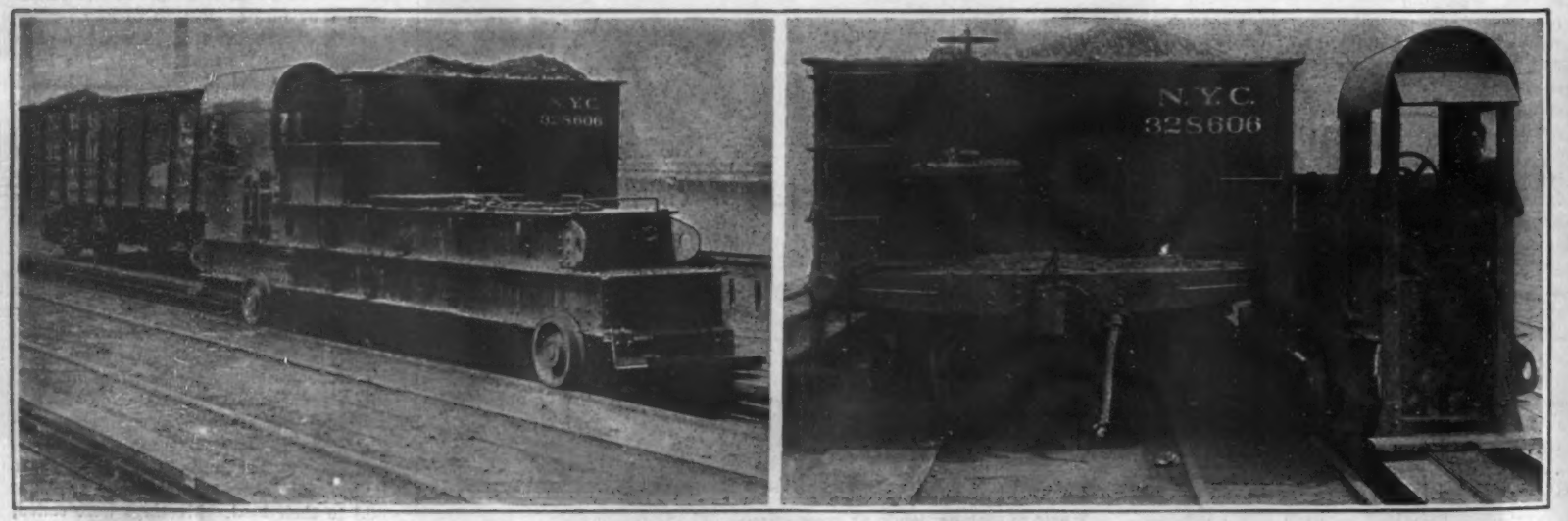
The Current Supplement

ONE of the most notable events in the scientific world is the advent of the great 100-inch reflecting telescope, at the Mount Wilson Observatory, which is now nearing completion. This is the largest instrument of its kind in existence, and by its use the boundaries of the universe, as at present known, will be greatly extended, and an immense number of new stars will be brought into view. The making of the mirror for this instrument, which is a triumph of American genius, was a monumental task, and some of the facts relating to this delicate piece of work are told in an article on *The Largest Reflecting Telescope in the World* in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2172, for August 18th. It is illustrated by a number of photographs. A very important feature in an effective army is that the men composing it shall have strong and serviceable feet. This matter is treated in an article on *The Soldier's Foot*, which discusses various common defects, and the possibilities of rectifying them. From time to time articles of wide interest on *Anomalies of Animal Life* have been appearing in the SUPPLEMENT. This issue presents another installment, accompanied by numerous illustrations, which will be read with pleasure by all. The doings of the German airships during the last few years have demonstrated that these craft are of value not only for war purposes, but will be an important means of communication hereafter. This subject is treated of in a paper on *The Development of Commercial Dirgibles*. The valuable article on *The Nature of Matter* is concluded in this issue. *Dropping Bombs from Aeroplanes* is an illustrated description of an ingenious instrument devised in Germany for sighting and estimating the range in dropping bombs on the desired object. *The Weather Business* gives an interesting review of the history of the U. S. Weather Bureau, and the work it accomplishes. Other articles of value are *The Problem of Cross-Atlantic Flying; The Structure of Matter* and *Calorific Value of Gaseus Fuels*.

Technical Talent for the National Advisory Committee for Aeronautics

THE National Advisory Committee for Aeronautics has just secured for an indefinite period the services of Prof. Lionel E. Marks, head of the combined departments of Mechanical Engineering of Harvard University and Massachusetts Institute of Technology. He will be assigned to assist in the special work of the Subcommittee on Power Plants, and will have charge of certain investigations relating to aeroplane engine design conducted by this committee at the Bureau of Standards.

Professor Marks is a recognized expert in thermodynamics, engine cycles, and particularly the gas engine, and is probably the best qualified man in the country to supervise the important investigations proposed.



The car pusher that does away with the switching locomotive: seen from one side and from the rear

A New Dirigible Driving Light

IT ought to be perfectly obvious that the purpose of an automobile light, be it headlight or searchlight, driving light or spotlight, no matter what its name, is to make driving at night safer. Unfortunately, it is only the light which comes back to the driver by reflection from the road surface that is of the slightest value to him. That it is which enables him to see and it forms but a small proportion of the beam projected from the lamp. If the driver had only himself to consider there would be no reason why he should not use such a powerful searchlight that the road would look "as light as day." But the light that does not come back is more than a mere waste. It is a positive menace; particularly that which never strikes the road but blazes directly into the eyes of an approaching driver. Not only are the pupils of the eyes contracted, but the sensitive retinas are paralyzed for a few moments, so that the victim is absolutely blinded. Numberless accidents have resulted from such conditions and a strong prejudice has arisen against powerful lights on automobiles. Too many a motorist, with reckless disregard of the other fellow's peril, lets his powerful headlights throw out a blinding beam upon passing traffic, not deigning to use his dimmers.

An obvious solution of the difficulty would be to direct the light upon the road in such a way that it would not shine into the eyes of other drivers. Efforts have been made to devise headlights which would confine their rays to the road, or to a zone whose upper limit would be below the level of a driver's eyes, but there are difficulties in the way of such concentration of light, particularly in a lamp permanently affixed to a car, because uneven loading of the car and uneven surfaces of the road are apt to throw the beam upward above this zone of safety. Here is where the dirigible light comes in—a lamp which is attached to the windshield, convenient to the hand of the driver, so that he may direct it where it is needed and may pick out obstructions in the road, or swing it to one side or the other when rounding a curve, illuminating the path that his wheels are to follow. There should be no prejudice against a light whose beam can be intelligently directed. Indeed, such a light is indispensable to the safety of the driver of a car when he has to contend with the glaring lights of inconsiderate motorists. With a powerful dirigible driving light, he may concentrate the beam upon the road directly in front of him and pick his way despite the glare of oncoming headlights.

The problem of driving lights is receiving a great deal of attention now. It is important that such lights be not only dirigible, but also capable of having their intensity and character of illumination regulated. An interesting example of such a lamp is shown in the accompanying drawing. The sectional view Figure 1, explains the construction of the lamp. The source of light is shown at A. There are three reflectors, the main reflector being indicated at B, while a secondary reflector C is formed on the door of the lamp. This light is designed to give only indirect illumination. The rays of the bulb A are not permitted to pass directly out of the lamp, but are shielded by a pair of thimbles, D and E, one of which is arranged to telescope within the other. These thimbles are also fitted with reflecting surfaces so that the light that shines into them is not lost, but is cast back upon the other reflectors, and thence passes out of the lamp. By moving the thimble D in or out the intensity of the beam may be varied. The spindle F, which projects from the front of the lamp, regulates the position of thimble D, the latter may be held in position by tightening a thumb nut. The bulb A may also be moved in or out with respect to the reflectors by operating the thumb piece G. At H is shown the customary pilot light.

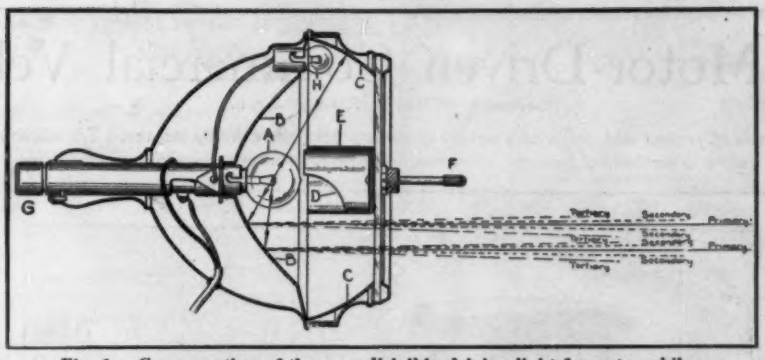


Fig. 1. Cross-section of the new dirigible driving light for automobiles

A median position, as at *c*, will give a full cone of diffused light. The thimble is adjusted to the position shown in Figure 2 for driving in cities or regions where dimmer laws are in effect. It may be permanently secured in this position to comply with requirements of certain states. For hard driving in the open country, the thimble is retracted, then by varying the position of the bulb, as at *d*, *e* and *f* respectively, of Fig. 3, a full beam of light is projected, whose intensity, however, is varied as indicated by the density of the lines in the cross-sections of the beams. Not only is the entire surface of the reflector B employed in concentrating the light, but the secondary reflectors C and D also come into play, casting back the light that shines upon them to the reflector B, whence the rays pass out of the lamp in a parallel stream.

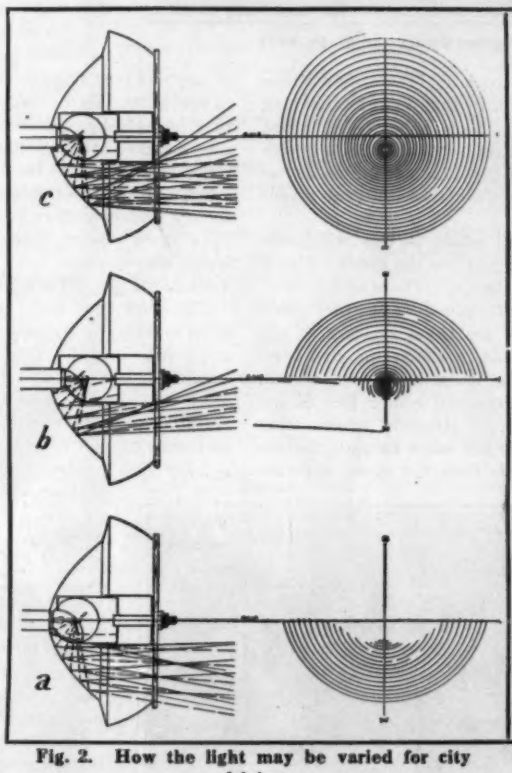


Fig. 2. How the light may be varied for city driving

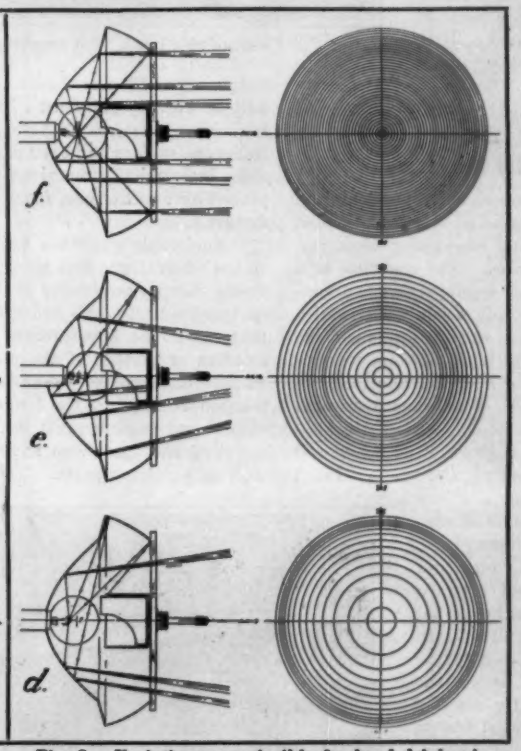


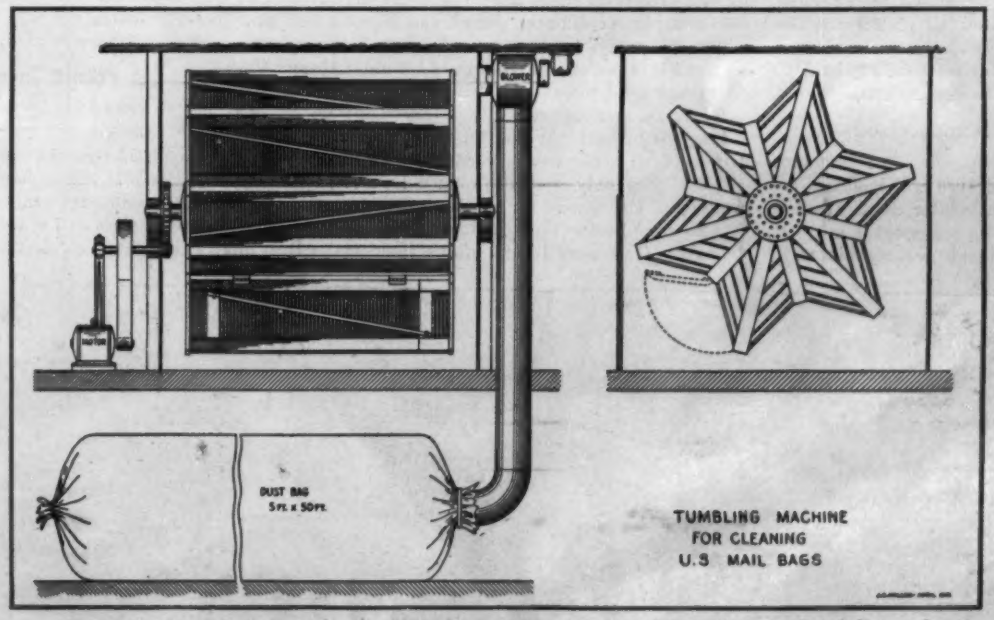
Fig. 3. Variations permissible for hard driving in the open country

Figure 2 shows how the flux of light may be varied by adjustment of the bulb when the thimble is moved to its innermost position. It will be noticed that the lower part of this thimble is cut away. Then if the bulb is moved in, as indicated at *a*, the rays coming from it will be cut away from the upper part of the reflector and will throw out light which is confined to the zone below the axis of the lamp. By projecting the bulb forward, as at *b*, the beam will be thrown up above the axis of the lamp.

A Contrivance For Cleansing Mail Bags

A VERY simple yet ingenious contrivance for effecting a much needed reform in the mail bag repair shop has recently been put into operation, and as the subject may perhaps interest others who might in some way profit by the matter mentioned, a description of it is hereby given. The reform needed was a plan by which mail bags returned from the service for repair could be cleansed of the dirt, dust and impurities gathered before being put into the hands of operatives. Dragged about way stations and in railroad depots, exposed to all sorts of weather and accumulating dust from every conceivable cause, these bags could not be handed over to the men and women engaged upon such work without some means being taken to cleanse them. Formerly done by hand, in the rush and hurry of bag handling, this cleansing was so imperfectly done that when the bags were brought to the assorting table and arranged for repair, there was constant complaint about the unsanitary condition.

The Fourth Assistant Postmaster-General, in whose Bureau this work belongs, set about to find a remedy. After some minor changes the plan finally adopted consists of large tumbling barrels of cages, made of wood, shaped inside after the pattern of a gigantic star, with slats arranged about six inches apart, the receptacle being tightly inclosed to prevent dust from escaping. The bags are thrown into these cages, several hundreds at a time. Revolving at a high velocity by electric power, the bags are thoroughly shaken, the dust being driven off into a very closely constructed room and carried thence by blowers into an immense canvas bag of considerable length, resembling a dirigible balloon. At stated intervals the end of this bag is opened and the accumulated dirt and dust removed. Four thousand bags a day are now treated by this process, and investigation has shown that the bags so cleaned are absolutely free of dust and dirt. By this process bags are not only made easier to repair because defects and damage are more clearly exposed and can be more readily noted, but all complaint has ceased and this class of work is no longer shunned as inimical to health and comfort.



Vertical section of the machine in which our mail bags are jarred free of accumulated dirt, and view of the star-shaped bottom

Bogus Salvarsan

THE New York City Department of Health has unearthed a sensational fraud in the manufacture of fake salvarsan, which was sold widely throughout this country as well as in Canada, Mexico and Central America, and consists of dyed table salt.

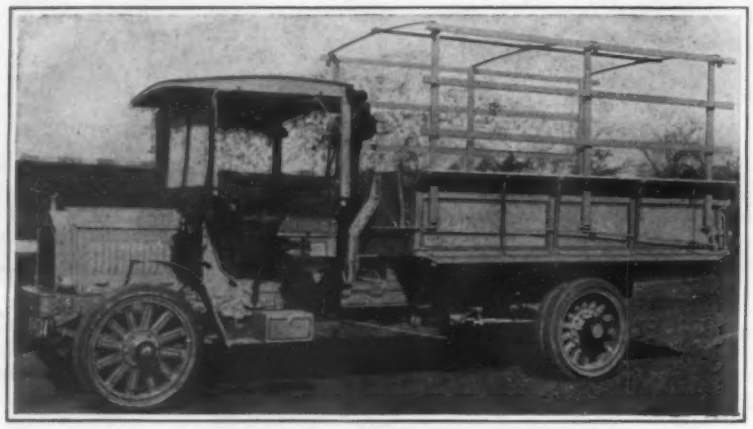
The Motor-Driven Commercial Vehicle

Conducted by VICTOR W. PAGE, M.S.A.E.

This department is devoted to the interests of present and prospective owners of motor trucks and delivery wagons. The editor will endeavor to answer any question relating to mechanical features, operation and management of commercial motor vehicles

Combination Dump and Stake Body

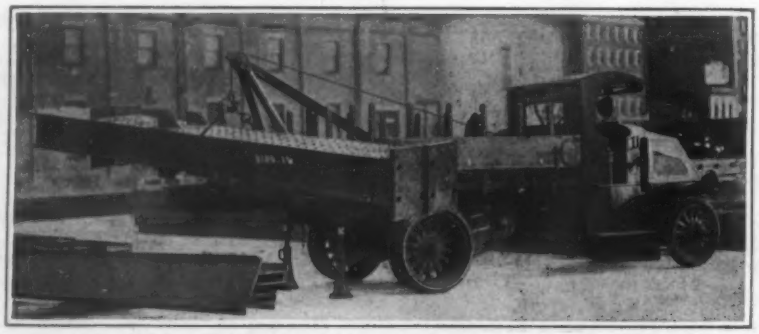
WITH the aid of a specially constructed combination dump and stake body, a Pittsburgh contractor is able to deliver a variety of commodities. Not only can this truck be used for hauling coal, coke, sand, gravel, feed, etc., but it readily can be converted into a stake body, for the hauling of furniture, freight, plumbers' supplies and other bulky articles. It is mounted on a standard chassis of 3-3½ ton capacity. The body was constructed to order and is a special design. Nothing whatever is taken off the truck when it is being changed from a dump to a stake body. All that is necessary is to lift the frame work of stakes and slats up and let it slide into the grooves which are made in the flare-board of the dump truck. It is also equipped with a tarpaulin which entirely encloses the body, this offering suitable protection to furniture or other freight that might be damaged by exposure to the elements.



Contractor's truck with combination dump and stake body

Wrecking Truck for Firemen

THE fire department of Boston recently purchased an apparatus which is expected to be of great practical value, not only in wrecking and emergency work but also for general hauling purposes. The machine is a standard 3½-ton capacity truck equipped with a conventional platform body and having a cab. A powerful power-operated winch is located at the forward end of the platform, while at the rear of the body, sockets are provided to receive the three legs of a short crane that can be set up whenever it is needed. The crane overhangs the chassis end in order to provide the desired clearance when handling bulky or heavy objects. The winch and crane are provided with 250 feet of wire cable, ⅝ inch in diameter, and when the crane is in use the rear end of the chassis frame is supported by two powerful screw jacks that are suspended from their tops and which may be dropped and set between the ground and the frame to make a solid base when heavy weights are lifted. In ordinary work the truck is backed to the object so that the crane can be set and the sling lowered and attached. By starting the winch the weight can be lifted free of the ground and carried whenever desired, providing that it is not so heavy that it requires the auxiliary supporting power of the screw jacks. The winch can hoist from or lower objects to the truck from buildings and the cable can be attached to a condemned structure and the machine used to demolish unsafe walls of burned buildings. The truck can also be backed to an excavation or cellar and the crane employed for removing heavy debris such as structural iron work. The truck has a drawbar so it can be used for towing any form of trailing vehicle and all of the tools, skids and equipment ordinarily required in wrecking work may be carried on a substantial platform. The readily demountable feature of the crane makes it possible to remove it and to use the truck for any haulage work that may be required in the department.



Wrecking truck recently acquired by the Boston Fire Department

Army Truck Details Standardized

THE indications are that the specifications for motor trucks intended for military use will be more accurately drawn and outlined in greater detail than as originally drafted and published a few months ago. It is expected that before the end of this year machines will be produced by our motor truck manufacturers which will be entirely standard with respect to interchanging important parts. Engines, chain speed sets, axles, radiators, springs and even main frames will be so closely alike in external dimensions that one can be easily replaced by another unit from a truck of different manufacture.

Considerable objection was raised to this standardization when it was first spoken of, on the ground that it would hamper originality of design. There is, however, no foundation for this belief, inasmuch as the only parts that are to be standardized are those relating to the location or placing of the part in the frame structure. Engine hangers, for example, must all have a certain relation relative to the longitudinal center line of the engine and engines must have a standard transmission coupling and must also have the same location for the various auxiliary parts. This does not mean that the details of the interior of the engine will need to be alike. The designer can use his originality in perfecting the inner parts of the engine which, after all are the parts that have the material bearing on the production of power.

This interchangeability of parts will be a boon to the truck assembler, inasmuch as if he fails to obtain deliveries of certain units from one parts maker, he can obtain a part of different design and manufacture that will have exactly the same system of installation hangers as prevails in the one that he could not obtain originally. There are good reasons for this standardization as it is an accepted fact that it has been thoroughly proven out during the present war that an army can not use motor trucks of all types indiscriminately without great difficulties. Not only does it produce trouble in forming convoys if the trucks are of different manufacture, but it also complicates the equipment necessary for maintenance. The more trucks of the same make that an army has, the more its problem of maintenance is simplified. Another advantage of the standardization is that the Government will have a large number of manufacturers to draw upon in case of need.

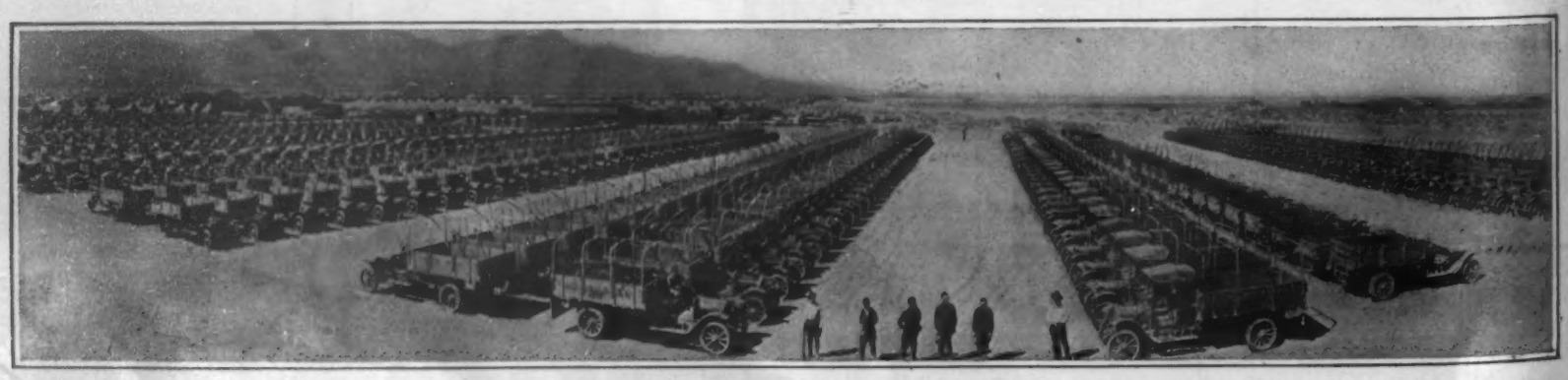
The details are not entirely settled at this time. Drawings have been prepared of several typical chassis with the principal location places indicated, and this lay-out is to be discussed and changed around until the main dimensions are settled upon that will apply to all types. Starting with a frame that has been standardized, as far as the location of the parts goes and using as many of the S. A. E. standard for details, such as rod ends, bolts, flanges, etc., and having a number of different gear boxes that will fit the chassis as well as a suitable number of engines and rear axles and other necessary parts, in the event of breakage of any one portion of the truck, it will be quite possible to use parts taken from damaged trucks of other makes that have become defective in other respects. In the new scheme, the part makers are coöperating in every way possible with the Government, and it is expected that much of the repair work on the field can be done by merely replacing worn or defective units with new ones from stock and sending the broken parts to the base repair shops, where they can be repaired by the proper mechancial processes.

The Army truck body types are, of course, to be made in an infinite variety, depending upon the requirements of the service in which they are to be used. As at present organized, a truck convoy will consist of 30 vehicles. With this number, a mobile repair shop fitted with tools suitable for making emergency and roadside repairs will be furnished, as well as an officer's truck, which will have a body that combines a passenger carrying portion as well as an office. There will also be one kitchen, and tank bodies for conveying gasoline, lubricating oil, and if operations are to be carried out in arid regions, water as well. The present plan of the War Department is to have the different forms of bodies designed to be mounted on chassis of the same design if they are to be operated in convoy. At the present time there are more transport or stake bodies needed than any other type.

The plans call for carrying the standardization process to such a point that not only will all chassis be adapted to receive various types of bodies, but that various parts of each distinct body type may be utilized in constructing still other body forms of entirely different design. It will be quite evident by the careful study that is now being given to this subject, that the United States Army will be in possession of the most complete motor truck equipment of any army in the world and one that will be of great value, because it will have been designed for the purpose intended and be composed of units well adapted to coördinate in the way that is necessary to secure most efficient transportation.

A French Institute of Applied Optics

ACCORDING to *La Nature* (Paris), the French government and various scientific societies in France are considering the foundation of an Institute of Applied Optics. It will include a college for training opticians and promoting research, a central optical laboratory for testing glass and optical instruments, and a trade school which will give thorough training in the practical branches.



Impressive array of trucks produced by one maker, now quartered at Fort Bliss, Texas, after service in Mexico

A New Freight System to Conserve Our Foods

(Concluded from page 109)

or stations. The service will be daily, tri-weekly, semi-weekly or weekly according to the average volume of the traffic, and freight for city "B" will be taken only in such cars. Under this method there will be no delay, no subsequent transferring or rehandling of the freight, and the car will move straight through to city "B" without breaking bulk.

In large cities, where a number of freight stations are maintained, traffic to the various principal destinations will be apportioned between the stations. For example, where conditions permit, very large shipping centers will be subdivided into zones, each embracing several freight stations. From each zone service will be given on specified days to a number of destinations. In such cases, cars for various points will be alternated between the stations in a given zone. If, for instance, a certain zone, containing several freight stations, is to have three cars a week to a certain destination, the car may leave Station "A" on Monday, Station "B" on Wednesday and Station "C" on Saturday. This will equalize drayage distance between shippers in various portions of the zone.

To eliminate the congestion of trucks and teams occurring at nearly all large freight stations in the afternoon, the "sailing hours" of cars for certain destinations will be made earlier than the general closing time of the station. To illustrate—at a station from which several regular cars are operated daily to sundry destinations, the "sailing time" for the cars to city "B" and to city "C" may be fixed at noon, and for city "D" and city "E" at 1 o'clock P. M., while freight for other points may be accepted up to the closing hour.

This will require the delivery of a considerable quantity of freight in the morning hours of the "sailing day." The result will be to distribute the receipts throughout the day, extend the capacity of the station and facilitate the movement of traffic. Shippers will be benefited, as their teams and trucks will not be forced to stand idle for several hours before being able to get to the platform, as is often the case under the present conditions.

The application of the plan at smaller stations—those at which less than carload freight would not accumulate into carloads with sufficient frequency to operate through cars to any given point—will be limited to the establishment of shipping days.

When making the new plan effective in any locality, its purpose and method of operation will be explained by railroad representatives to the local board of trade, chamber of commerce and other trade bodies who will be expected to put the plan before farmers and shippers generally.

Now that we are a principal in the most stupendous war the world has ever seen, this plan of one of our big railroads to cut out wastage due to previous inefficient methods of transportation can only be regarded as one of the most worth-while food conservation measures yet undertaken, and if it works out as now seems most probable, doubtless it will be adopted by every other railroad in the United States.

French National Library Prize

THE French National Library prize of $1,000, founded by M. Angrand, will be awarded in 1918 for the best treatise published in France or other countries during 1913 to 1917 upon the history, ethnography, archaeology or linguistic science concerning the indigenous races of America previous to the arrival of Christopher Columbus.

Authors who desire to compete for the prize are required to send ten copies of such works to the Secretary of the National Library before January 1st, 1918. The jury will assemble early in January to decide upon the works to be admitted to the concourse.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of SCIENTIFIC AMERICAN.

Electrical Devices

ELECTRIC VALVE-GRINDER.—H. C. NEWMAN, address Loren O. Clampett, 330½ W. 46th St., Los Angeles, Cal. A specific object of the invention is the provision of a valve-grinder so designed as to automatically impart a partial

ELECTRIC VALVE-GRINDER

turn to the valve while the same is seated, lift the valve and impart a shorter backward turn while the valve is lifted, and indefinitely repeat its cycle until the valve is properly ground and the tool removed.

WIND-WHEEL ELECTRIC GENERATOR.—A. H. HEYBOTH, Geraldine, Mont. A specific object of the invention is the provision of a novel arrangement of poles forming the stator of the generator, certain of which poles have inducing and induced windings, and some are unwound so that by coöperation with inductors or metallic shoes of the wind wheel the passage of the inductors across the poles will generate an electromotive force in the induced winding for any desired electrical purpose.

DEVICE FOR COUPLING A TELEGRAPH TRANSMITTER AND SENDING-KEY.—C. M. HOLMES, 115 N. Forsythe St., Jacksonville, Fla. An object of the invention is to improve a telegraph key for permitting a transmitter to be connected by a cord with the key, the coupling means including a split metal socket on the key with its parts respectively connected with the terminals of the key, and a split plug insertible in the socket and connected with the conductors of the cord, whereby the terminals of the transmitter can be electrically connected in a reliable and positive manner with the sending key.

Of Interest to Farmers

HARROW.—K. A. SOININEN, 4118 8th Ave., Brooklyn, N. Y. The object of the invention is to provide a harrow especially designed for harrowing freshly plowed up sod or prairie soil, also for harrowing ground for a second crop without first resorting to plowing; it is arranged to insure a thorough preparation of the soil to any depth with a view to producing a bed ready for receiving seed.

Of General Interest

ESCAPEMENT FOR CLOCKS AND WATCHES.—J. H. GREELY, 1934 Hudson Ave., Chicago, Ill. An object in view in this invention is to produce a spring balance wheel which is free and independent in its actions and positioned to act without the usual lever to force the same back and forth, the construction being such as to measure time while the levers associated therewith limit and regulate the action of the escapement wheel.

BOLT-BOARD.—W. M. AUSTIN, 53 Leonard St., New York, N. Y. The object of the invention is to provide a bolt board more especially designed for winding thereon textile fabrics having embroidered borders or other thickened portions and arranged to compensate for the increased thickness in the embroidered portions with a view to provide a bolt approximately uniform in thickness throughout its length.

CAMERA.—A. L. TRIPPEL, care of Miami Copper Co., Miami, Arizona. The invention relates to film cameras, and the main object is to provide means whereby the photographic field of a desired subject may be determined by means of a finder or by use of the focusing ground glass as in a plate camera. A further object is to provide means for limiting the movement of the spools toward each other, whereby the size of an exposed portion of film may be controlled.

ICE-CREAM FREEZER.—E. THOMPSON, 235 East 41st St., New York, N. Y. The object here is to provide a freezer arranged to insure an effective action of the circulating freezing medium, and avoid tapping of the shells for pipe connections thus maintaining the shells in unbroken continuity. Another object is to permit convenient and quick assembling of the parts and increase in the strength of the machine.

APPARATUS FOR CHECKING RUNAWAY HORSES.—B. ROSENFELD, 957 First Ave., New York, N. Y. Among the objects which the invention has in view are: to provide means of the character described operable independently of the weight or traction conditions of the vehicle; to regulate the force applied for the performance of the function above indicated; and to simplify and reduce the cost of construction and installation of the apparatus.

ADJUSTABLE AND REVERSIBLE BOOKMARK.—F. W. STECHAN, 927 Adeline St., Oakland, Cal. This invention relates to a bookmark having a movable pointer or pointers adjustable longitudinally in a slotted flat strip, to be positioned at any point along the same, the pointer being disposed either to the right or to the left, the pointer will not penetrate the leaves and will not itself be damaged by catching other objects.

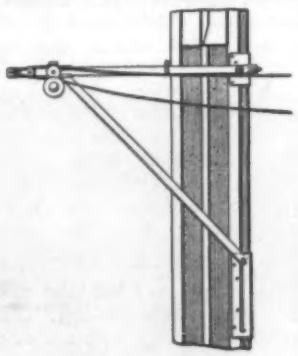
GARDEN IMPLEMENT.—A. S. BERNARD, Spreckles, Cal. The invention provides a combination garden implement having an element that may be employed for raking spaded ground and a plow that may be employed for forming a furror, or for use as a seed coverer, and to so construct the implement, that while it possesses strength, it will at the same time be so light that it may be used with facility by a boy or a woman.

GAS FIRE-KINDLER.—T. KAUFER, 74 Suydam St., Brooklyn, N. Y. The invention relates to stoves and furnaces, among the objects of the invention are to provide a combined fuel supporting grate and a gas-igniting means, the same comprising a main or body portion and an auxiliary portion lying directly thereover, each portion having longitudinal bars registering directly with similar bars of the other portion, bars made tubular for the conveying of gas, particularly for kindling of a body of fire in the coal wood or the like supported upon the grate.

COLLAPSIBLE HOUSE.—E. M. ARONSON, Fort Scott, Kansas. The invention has for its object the provision of a frame for supporting the building which may be easily and quickly set up or knocked down which will furnish a comparatively strong and rigid structure when set up, and will be capable of storage in small compass when knocked down, and while strong is yet light in weight and easily transported.

FOLDING CRATE.—F. G. KIEHL, Muscotah, Kansas. The object in this invention is to provide a crate of the character specified adapted for holding poultry and the like, wherein the crate is arranged to be set up to form an enclosure of suitable size for containing poultry, or knocked down or collapsed into small compass for transportation and when in either position the parts are firmly locked against displacement.

CLOTHES-LINE SUPPORT.—A. G. J. JACOBSEN and A. BLASER, address Alexander Blaser, 40 Lincoln St., Jersey City, N. J. Among the objects of the invention is to provide a support for an endless clothes line, said support being adapted especially for use in or in connec-



CLOTHES-LINE SUPPORT

tion with a window of an apartment house or the like, whereby the operator may hang out a wash or remove the same without reaching out of or beyond the window, the operation of the device, and the clothes line may be performed without danger of soiling the clothes or subjecting the operator to unnecessary lifting strain.

FLASH-POINT TESTER.—F. VON BICHOWSKY, Berkeley, Cal. An object of the invention is to provide a device by means of which the flash points of oils like kerosene may be recorded automatically. A further object is to provide a device in which the testing of the oil is rendered more accurate by an agitation of the same during the heating of the oil. A further object is to provide a tester which is adjustable for varying the barometric influences.

STERILIZER.—P. MALCAMP, care of Mr. Charbounet, Druggist, cor. Resbigney and Frenchman Sts., New Orleans, La. The object of the invention is to provide a sterilizer comprising a container for the material to be sterilized and having a cover supported by the container feed above the level of the material and adapted to be agitated by the boiling of the material adapted for use with the wick heater forming the subject-matter of my co-pending application Serial No. 876,829 wherein a damper is provided movable toward and from the wick to extinguish the same, and mecahnism in the form of a swinging lever for lifting the damper when the outer end of the lever is depressed.

FLUID-GAGE.—M. M. DIMOND, 1777 Broadway, New York, N. Y. This invention relates to a fluid gage particularly adapted for use in connection with gasoline tanks employed on motor vehicles; the object of the invention is to provide a simple and efficient indicator which can be manufactured at comparatively low cost.

CHRISTMAS-TREE HOLDER.—H. ELDE, 2024 Harmon St., Brooklyn, N. Y. An object of the invention is to provide a support with which tree trunks of different sizes can be used without any necessity of adjusting the support and in which support the friction caused by the weight of the tree is reduced to a minimum.

ATTACHMENT FOR OIL-CANS.—E. A OLIVER, Richland, Missouri. This invention relates generally to oil-cans and particularly to attachments therefor whereby to make pos-

ATTACHMENT FOR OIL-CANS

itive the springing of the bottom of the can in forcing the oil out, the object being to provide a simple, handy, and inexpensive attachment which will be durable and ready for operation at all times.

STERESCOPE.—H. W. HALES, Ridgewood, N. J. This invention overcomes some defects in ordinary sterescopes and to make a more portable and universal instrument and one that is particularly adapted for the use of commercial salesmen to show to prospective customers pictures of the merchandise they have to sell, as its extreme compactness allows it to be carried readily in the pocket.

RIFLE BARREL.—B. HOLTER, Whitefish, Mont. The object here is to provide a rifle barrel arranged to insure the long life of the barrel, to increase the velocity of the projectile, and to insure accurate flight thereof in comparison to a like projectile fired from a barrel of usual construction. To accomplish this the wall of the bore of the barrel is made polygonal in cross section.

SAFETY DEVICE FOR POCKETBOOKS.—D. T. LYNCH, 1941 Southern Boulevard, Bronx, N. Y. This invention relates particularly to a construction which is especially adapted for use in the pocket for holding a pocketbook or wallet in place and against unauthorized or accidental removal. It provides a construction which may be connected or fastened to a pocket at one end while the other end merely engages the pocket and resists removal.

GUN-MAGAZINE.—J. F. HECKMANN, care of Steamer Monator, Lupus, Mo. The invention provides a gun magazine having openings so that the user may at any time ascertain the number of shells or cartridges remaining in the magazine. As the openings are preferably in the under side of the magazine, there is little danger of moisture or foreign matter entering through the openings, while any foreign matter which may become disposed in the magazine will pass out through the openings when the gun is carried in the usual manner.

BIRD HOUSE.—E. H. REIBER, West Webster, N. Y. This invention relates to an improved construction for bird houses and has for an object the provision of means which will respond to the habits of the birds so that, though the house is artificial it supplies a substantially natural environment. Another object is to provide an artificial with a protecting natural outer coating or shell and a prepared comparatively loose body adapted to be removed by the birds when forming their nest.

PROCESS OF STERILIZING LIQUIDS.—JEAN MÉRIE, 135 Rue d'Alésia, Paris, France. The invention relates to improvements in the process of sterilization and has for an object to permit of the initial sterilization of the apparatus before the liquid to be treated is admitted thereto and to bring about the sterilization of the liquid at the very commencement of the operation.

PROCESS FOR REMOVING PAINT AND VARNISH.—F. B. CASMIRE, Chanute, Kans. The object of this invention is to remove paint and varnish from furniture and the like without the use of strong alkalies which have an injurious effect upon the wood, such as raising the grain, leaving the wood in a condition which does not permit it to be refinished without subsequent operations such as sandpapering, etc.

Hardware and Tools

SQUARE-GAGE.—B. S. THOMPSON, 844 Franklin Street, S.E., Grand Rapids, Mich. The invention relates particularly to what are technically termed height gages, and which are now provided as a separate implement, the main object of the invention is to provide a gaging attachment for a conventional square and which attachment is capable of very fine adjustments. The adjustment may be made by means of the scale on the square or by means of calipers or dividers.

TOOL-HOLDER.—V. H. AURICH, 42 Myrtle Ave., Jersey City, N. J. The principal objects which the invention has in view are: To provide mechanical means for controlling the path of operation of a metal-cutting tool, to provide means for setting the radius of the path of the cutting edge of said tool, and to provide a scale for setting the cutting tool and the radius of operation thereof.

AUTOMATIC SHELL-TONGUES.—E. E. LOFLIN, Foxwood, Miss. The prime object of the invention is to provide a device in which are provided pivoted long sections or grabs, and means to cock or set the grabs in open position, together with means to cause the automatic release of the grabs when the tongs are lowered to the bed of the stream or other body of water.

PIPE-COUPLING.—H. C. BREWSTER, care of Oil City Iron Works, Shreveport, La. The invention has for its object to prove a coupling wherein the joint is made by a tapered stem within a tapered box, with a ball-bearing ring for locking the stem against longitudinal movement, while permitting rotating of the ring with respect to the stem to prevent any possible sticking between the parts, and to reduce friction between the joints causing them to be easily unscrewed.

APPARATUS FOR TREATING SAWS.—L. LE R. COOE, 218 S. East St., Indianapolis, Ind. This apparatus for hardening tempering, and strengthening saws has for its object to provide a means and apparatus for supporting the saws during the hardening and tempering in such a manner that they cannot kink or bend or get out of true. During the hardening the saws are supported from a pipe, placed in the furnace and heated, after heating are dipped straight down into the hardening oil. The saws are withdrawn from the oil and clamped in channel-shaped forms, having side wales of less depth than the width of the saws, to permit the teeth of the saws to project.

RAPID-FIRE GUN.—M. C. BARRY, 177 Luchie St., Atlanta, Ga. The invention relates generally to small arms, and particularly to a rapid-fire gun, the object being to provide in the construction of such devices a means of more ready and quick handling and effective use thereof. The gun includes a tripod support, a plurality of barrels, which may be controlled as readily and expeditiously as one barrel, the number of barrels may depend upon the particular use for which the gun is intended.

Household Utilities

CUSPIDOR.—C. MÜLLESTEIN Room 37 Bible House, 9th St. and 4th Ave., New York, N. Y. The object of the patent is to provide an arrangement whereby the cuspidor can be used as a pocket cuspidor, formed in such a way as to hide the construction when in use while allowing the construction to be such as to produce a substantially air-tight container.

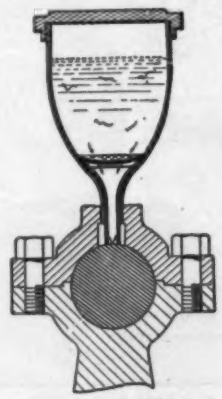
Machines and Mechanical Devices

GRINDING MACHINE.—F. STARIN, 304 N. Main St., Springfield, Mass. This invention relates to machines for grinding and polishing raw castings of the rings of ball bearings, and provides a new and improved grinding machine arranged to simultaneously grind three of the four faces of a ball bearing ring without changing the latter in its holding chuck.

ROAD FINISHING MACHINE.—E. H. NEWMAN, Spring Lake Beach, N. J. This improvement provides means for smoothing the surface of roads by eliminating surface ridges and hummocks therefrom; provides an implement with means for shifting laterally the top surface of a roadbed; and provides an implement with a ballast which may be used as a filler for repairing the roadbed.

PRINTING PRESS.—L. MEYER, 815 Caldwell Ave., Bronx, N. Y. The invention relates to printing presses particularly adaptable for printing on continuous ribbons or tapes. Another object of the invention is to provide an efficient printing press whereby sections of ribbon or tape of different lengths can be printed, on the press and whereby two colors may be printed.

GREASE CUP.—H. E. ANGO, Oak Park, Ill. This improvement has for its object the provision of a device adapted to be arranged within an oil cup, for conducting the grease or oil to the



GREASE CUP

shaft or the like to be greased, which will be automatically operated to feed the oil or grease by the rotation and vibration of the shaft, and the weight of the grease.

VALVE-CHANGING DEVICE.—A. BROADMEYER, care of The W. O. Hickok Mfg. Co., Harrisburg, Pa. The present invention relates generally to valve changing devices, particularly to adjustable means for controlling the periodical opening and closing of the air valve utilized in paper feeding-machines, and in connection with paper ruling machines to which the paper is fed. The improvement relates particularly to an adjustable control of the regulating valve to operate in connection with sheets of different size, providing for ready change from sheets of one size to sheets of another size.

(Concluded on page 124)

The Submarine Problem—XII.

(*Concluded from page 113*)

absolutely prohibiting the cutting of any doors or openings through these bulkheads. Of course, the mere suggestion of this sort of thing will raise a howl of disgust from the engineering staff that will operate these ships, on the ground that doorless bulkheads make it inconvenient to control a plant and engineering force that is in separate incommunicable compartments. But the fact remains that the doorless bulkhead, carried up high above the water-line to a watertight bulkhead deck, is a rational answer to the torpedo.

High explosives are never so effective as when they meet with resistance, and the best way to handle them is by a policy of acquiescence or non-resistance. For this reason we are willing to throw away the inner skin and longitudinal bulkheads and permit the gases to expand freely within the whole space between bulkheads. To assist in this, the hatch coverings in the main and lower decks should be made as light as possible and laid loosely in place, so that the gases can throw them off and have the whole space from tank top to top deck to expand in. To afford additional vents for the gases, on each deck two hatches should be provided, one on each side of the main hatch. These would be held down by a light fastening, which would give way under pressure of the explosion, and assist in releasing the gases.

It is our belief that a ship built along these lines with doorless bulkheads, with light hatches and vent chambers that would be blown open, allowing the escape of the gases, could withstand torpedo attack and receive one and possibly two torpedoes without necessarily going to the bottom.

America Faces A War Tragedy

(*Continued from page 117*)

speakers addressed them, appeals were made. Coöperation was arranged for on the various farms on the several Projects. One man had two more horses than he could work and one man too few. His neighbor had an extra hand and was short on horses. A combination was effected beneficial to both. To get in the hay crop on some Projects, all the owners of machinery combined in a hay harvesting company which moved from farm to farm, giving each the time advantage of the best of facilities, the best of machinery. A man who would take a week to harvest his hay crop had it done in a day, and found he need only give four days labor himself to help the other fellows out, so great a saving does proper coöperation effect.

Where seed couldn't be bought in the open market, Governors of States commandeered it—not by a legal process but by the same type of patriotic appeal and moral suasion which has made the farmers of the country crop-mad to show their patriotism. Utah raised a fund of $100,000, New Mexico $200,000 to help the farmers add to their acreage. A bill was introduced in Congress to appropriate $5,000,000 to help the farmer add to his acreage. At present writing the bill is still pending. Community organizations tackled the labor problem with business exactitude. Stock, men, machines were card indexed, located, mobilized. And in the midst of it all came the call for volunteers, and husky young farmers whose labor was worth a dollar a minute in the field for every penny it was worth in a trench dropped hoe and reins and plow handle and stood beneath the colors. Luckily the conscription bill stopped this farm labor exodus before it was too late, but sufficient harm was done as it was.

On the Reclamation Projects the solidarity of a great common interest—the link of water which makes all the Project people a great family—led this new land to outdo itself. And it should be remembered that all the Reclamation Projects are new lands, settled by new people, who have come from the ends of the country, all struggling with new problems. They have not the coördination and the coöperation of a community which has years of

(*Continued on page 125*)

RECENTLY PATENTED INVENTIONS

(Concluded from page 122)

Machines and Mechanical Devices

PROCESS FOR COVERING WITH A PROTECTIVE PLASTIC COATING FLATTENED STRIPS AND PRODUCT THEREOF.—E. GUICHARD, care of W. R. Weeks, 95 Liberty St., New York, N. Y. The invention relates to a process for covering flattened strips with plastic material so that the strip in cross section has a covering increasing gradually from the center towards the edges. Hitherto when a flattened strip uniformly coated, is dried the coating thereof contracts, reduces the thickness at the edges.

DUST-COLLECTOR.—F. KERLIN, 491 Vanderbilt Ave., Brooklyn, N. Y. The invention relates to dust collecting devices and has for an object the provision of construction which does not require any power for operation but will collect and discharge at predetermined points dust forced therein. Another object is to provide a collector in which the force of the dust-laden air may be varied, in order to retard the movement sufficiently for causing a precipitation of the dust.

TEMPLET.—A. J. PARRISH, Paris, Ill. This invention has for its object to provide a device for constructing monolithic brick roads, wherein mechanism is provided capable of being moved ahead as the work progresses, for smoothing and leveling the concrete base of the road, and for applying a thin layer of dry cement and sand to the leveled base upon which the brick may be laid.

MIXER AND PULVERIZER.—R. W. CHRISTIAN, Manchester, N. C. The object of this invention is to provide a simple and inexpensive machine adapted particularly to intermittently and thoroughly mix and pulverize fertilizer materials which have been either roughly mixed or spread in uniform layers in a suitable container; the machine is so constructed that it obviates the necessity of chains, caring and other complicated parts.

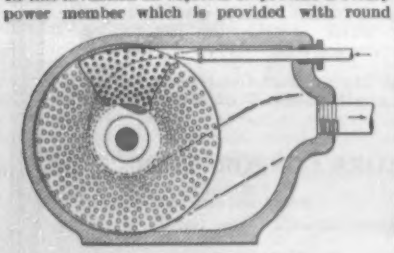
ORE-SEPARATOR.—E. COHEN, 625 Jackson Ave., Joplin, Mo. Objects of this invention are to provide a device which will make a complete separation of the valuable material from the gangue regardless of the degree of fineness of the latter, and to provide a device which is especially adapted for treating slimes and like masses, and for working tailings which are the result of the treatment of materials by other methods or machines.

CAN-LABELING MACHINE.—A. R. LENDNER, 45 Bryant St., N.W., Washington, D. C. An object of the invention is to provide a label-pasting and advancing device, the pasted label being received by a waiting can carrier as the label is ejected from the pasting machine; another object is to provide means for securing the opening key to the can and immediately thereafter to fold the loose ends of the label over the side of the can, pressing them into contact Another object is to provide means for continuously feeding labels to the pasting mechanism.

SWINGING-GEAR FOR DAVITS.—E. W. MYERS and A. E. SHARPLEY, S.S. Miami, care of The Peninsular and Occidental Steamship Co., Key West, Fla. The invention relates to ships and has particular reference to means for manipulating davits for the lifeboats; among the objects is to provide a swinging gear for davits which may be relied upon to lower the boats easily and radiply even though the ship may have considerable list.

BUTTONHOLE-FEEDING MECHANISM.—E. C. GERSTENBERGER, 169 Ten Eyck St., Brooklyn, N. Y. This invention relates to buttonhole sewing machines, its object is to provide an improved feed machanism arranged to insure a positive gripping or braking of the feed wheel in a very simple manner; to accomplish the desired result use is made of a gripping or brake block extending loosely into a groove in the feed wheel and resting on the bed plate or other fixed support and a pendulum depending from the said block and adapted to impart a rocking motion to the gripping or brake block to move the latter into gripping engagement with the walls of the feed wheel groove.

ROTARY POWER MEMBER.—W. D. MCGOWAN, 35 Washburn St., Jersey City, N. J. In this invention an object is to provide a rotary power member which is provided with round



ROTARY POWER MEMBER

blades whereby the blades will react against a propelling medium flowing in either direction. A still further object is to provide a rotary power member which may receive the steam of a propelling medium on the periphery or on the side.

WIRE-TYING MACHINE.—H. E. PITTS, P.O. Box 181, Springfield, Ore. The invention relates to a machine for tying bundles of laths, headings, shook staves, pickets, stakes, boxes, fruit boxes, or shook crates, as well as other articles required to be tied by wire. A particular object of the invention is to provide a portable machine, readily shifted from place to place for the convenient tying operation.

ROAD-BUILDING MACHINE.—R. M. MYERS, Attica, Ohio. The invention provides a machine especially adapted for distributing and leveling stone slag or gravel on roadways wherein the distributor is adapted to be drawn behind a truck and to receive material from the truck and distribute a uniform layer of material on the roadway as the truck moves along.

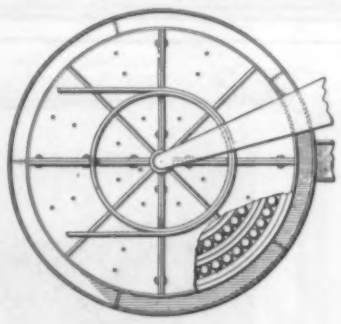
WEIGHING SCALE.—T. B. POWERS, 78 Warren St., New York, N. Y. Among the principal objects which invention has in view are: to simplify the supporting structure for the platform of a scale constructed and arranged in accordance with the present invention; to provide an adjustment for the device employed for recording depression of the platform; and to simplify and reduce the cost of construction.

BUTTON-CUTTING LATHE.—P. F. DUSHA and A. FEYK, 1797 First Ave., New York, N. Y. In this the invention relates to button making machines and deals particularly with a lathe for cutting blanks from green snail, trochus and other shells. Among the objects of the invention is to improve the method and means of cutting blanks from irregular shells in a simple, expeditious and economical manner and without the necessity of cutting the shells with a circular saw into sections, or otherwise breaking the shells into pieces.

STRIP-METAL BLOCKERS. J. G. MENZER, 14 Spencer St., New Bedford, Mass. The primary object of the invention is to provide a device automatic or practically automatic in its nature for initiating the rolling or winding of a sheet or strip of metal or the like upon a block as such sheet or strip is received from the rolls of a rolling mill or their equivalent.

WASHING-MACHINE.—F. C. SHEARING, 1040 Bird Ave., San Jose, Cal. The object of this invention is to provide a movable rubbing surface, presenting a corrugated surface to the rubber, and permitting upward movement of the water there through but not downward, another object is to provide means for wringing, the clothes after having been washed, thereby permitting the feeding of the clothes to be washed into one end of the machine and delivering the same to the rinse water saving one handling of the articles.

ORE-GRINDING MILL.—P. A. MAC EACHERN and N. O'DANIEL, address Nolen O'Daniel 218 S. Lafayette St., Denver, Colo. The invention has for its objects to provide a mill wherein a fixed and a rotatable member are provided, the said fixed member being circular and ar-



ORE-GRINDING MILL

ranged coaxially, and the rotatable member being mounted to rotate with respect to the fixed member, the said members having registering circular runways or rotaries in which are mounted series of balls, and wherein a launder encircles the sections being secured to the fixed member for receiving the ground material.

LUBRICATOR.—R. G. BACHTEL, Goodland, Kans. The invention relates to piston rod lubricators and has for its object to provide a mechanism of the character specified for continuously applying a film of lubricant to a reciprocating member, as for instance, a piston rod, wherein the means for applying the lubricant is controlled by the reciprocation of the piston rod.

APPARATUS FOR EMPTYING SUPERPHOSPHATE REACTION CHAMBERS.—H. W. HALL, Zurich, Switzerland. The invention relates to apparatus for emptying superphosphate reaction chambers by means of a transportable, rotating scraping machine, running on rails and comprising a trolley carrying an electric motor for driving the cutters only. The principal object of the invention is the possibility of emptying reaction chambers of rectangular or cylindrical form, without costly alterations to an existing plant.

SAFETY-CATCH FOR ELEVATOR DOORS.—B. SPITZFADEN, 51 Maiden Lane, New York, N. Y. An object of the invention is to provide a safety-latch that may be applied to elevator cars and doors irrespective of the space between the car and the threshold at the landing. A further object of the invention is to provide a trip or cam on the elevator car of a character that it will yield in the event of the latch bolt not responding to the action of the cam thereon.

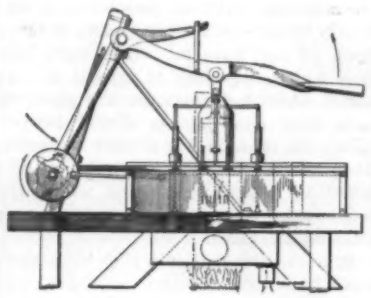
SILENCER AND CONNECTING MEDIUM FOR ELEVATOR DOORS.—B. SPITZFADEN, 51 Maiden Lane, New York, N. Y. The object of the invention is attained by employing as a connecting medium between the hangers of the respective doors the arrangement of an endless, flexible element, maintained under tension while permitting freedom of movement, the arrangement prevents the possibility of accidental interference of the moving parts with one another, as well as preventing noise-producing contact.

DISPLAY DEVICE.—W. C. GILLESPIE, Goodrich Bldg., Phoenix, Arizona. The invention has for its object to provide adevice by means of which a series of cards bearing advertising or, other matter, may be displayed in succession, the displayed cards being returned to the magazine for redisplay in turn.

ICE CREAM CUTTER.—H. A. MASON, 183 Weir St., Taunton, Mass. The object of this invention is to provide an ice cream cutter which may be operated quickly, being constructed with few and simple parts it permits the operator to quickly and thoroughly cleanse the device.

EDGE-TRIMMER.—A. F. WERTMAN, care of W. L. Pike Shoe Co., Hummelstown, Pa. The object of this device is to provide an edge trimmer by means of which the edge of soles of shoes may be trimmed smoothly, that is to say, without undulations which the cutter usually makes due to the vibration of the shaft on which the cutter is secured; a further object is to prevent vibration of the shaft, and protect the workman from receiving an injury from the cutter during operation.

CRISPETTE MACHINE.—F. W. BOURGOIN, St. Louis, Mo. The invention has for its object to provide a machine of the character specified wherein a plurality of molds is provided and a plunger coöperating therewith, the molds being



CRISPETTE MACHINE

mounted in a carriage to be moved in alternation beneath the plunger, and wherein on ejecting means is provided controlled by the movement of the plunger for ejecting the formed crispettes, and wherein the movement of the plunger also controls the movement of the carriage.

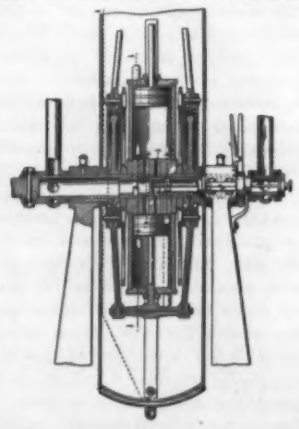
Musical Devices

PEDAL MECHANISM FOR PLAYER-PIANOS.—R. P. POTTER, 11 and 13 Garden St., Stamford, Conn. The general objects of the invention are to simplify the construction of mechanism of the character referred to so as to be reliable and efficient in use comparatively inexpensive to manufacture, and so designed as to comprise a minimum number of parts which are easily and quickly assembled and operate without excessive play, looseness or noise.

GUITAR BRIDGE.—A. FICKERT, 46 Irving Ave., Brooklyn, N. Y. The principal object of this invention is to prevent the strings of a guitar from pulling out of their points of anchorage to provide a simple and efficient means for holding the anchored ends of the strings of guitars or similar musical instruments; and to strengthen the construction of the bridge.

Prime Movers and Their Accessories

ROTARY ENGINE.—A. WATTERBERG, Sanish, N. D. An object of the inventon is to provide a reversible engine which is simple and efficient, which comprises a plurality of radially-disposed cylinders revolubly mounted about a fixed axis



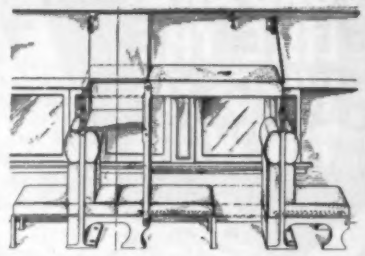
A VERTICAL AXIAL SECTION OF THE ENGINE

with means for actuating the pistons within the cylinders during the revolution of the cylinders. Another object is to provide a casing which encloses the entire engine and which also serves as a lubricant container in which the engine works.

INTERNAL COMBUSTION ENGINE.—P. C. ELLIOTT, 5404 Virginia Ave., Kansas City, Mo. This invention has particular reference to the inlet and exhaust ports and the valves therefor for controlling the passage of the motive fluid, to and from the engine cylinder. An object is to provide rotary valves for the different parts, each valve being constructed with the end in view of automatically grinding the same, increasing the possible valve opening, securing perfect timing due to the absence of the usual spring lag and effecting thorough scavengering.

Railways and Their Accessories

SLEEPING-CAR BERTH.—P. R. ODELL, P. O. Box 1046, Butte, Mont. The invention is an improvement in sleeping car berths, and has for its object to provide a section wherein a dressing aisle may be provided in connection with each of the berths. The upper and lower berths



VIEW SHOWING BERTH WITH DRESSING AISLES OPEN

each have a section hinged to swing upwardly to provide dressing space and a foot board supported below the said section of the upper berth, said section and foot board being at the opposite end of the berths from the hinged section of the lower berth.

Pertaining to Recreation

ELECTRIC TOY MOTOR.—J. M. FISHER, 414 Pacific St., Brooklyn, N. Y. The principal object of the invention is to provide an extremely simple and cheap electric toy, capable of developing a strong torque and high rotating speed. The invention comprises various novel features of construction and arrangement of parts.

Pertaining to Vehicles

VEHICLE-WHEEL.—M. PRIETO, A. TERESA and M. GOIZUETA, address Miguel Goizueta, 36 Mercaderes St., Habana, Cuba. The invention relates generally to vehicle wheels, and more particularly to vehicle wheels adapted to a type of tire which may be readily formed much more quickly and cheaply than heretofore possible. The body portion of the wheel is stamped from a single piece of sheet metal having a central opening and an outer annular flange forming a flat rim portion provided with a plurality of openings. The tire has inflatable tubes which may be individually removed, inflated or repaired through the rim openings without removing the tire.

TIRE.—A. TERESA, address Miguel Goizueta, 36 Mercaderes St., Habana, Cuba. The invention relates generally to tires for automobiles and other vehicles, the object being to provide a durable construction, partaking both of the nature of a pneumatic and cushion tire; the body of the tire is of the shape of the usual tire and having an annular series of cells separate from one another and communicating by means of individual openings through the flat inner periphery of the tire, small inflatable tubes being disposed in certain of the cells and the body, its flat inner periphery being otherwise solid.

RESILIENT WHEEL.—W. J. FABER, care of C. C. FABER, 1821 Brooklyn Ave., Brooklyn, N. Y. Among the objects of this invention are to provide a wheel having a tread and rim portion including lateral shele parts constituting a rigid rim or the equivalent of a rim, said shele parts being adapted to house within or between them a pneumatic tire of a resilient nature against the outer portion of which a circular series of tread blocks are adapted to work radially.

LUGGAGE-CARRIER FOR AUTOMOBILES.—E. M. ARNOLD, 427 Maple St., Ottawa, Kans. The invention relates to means for carrying trunks and luggage on an automobile, the object being to provide a carrier applicable to the running board of the machine, whereby the luggage may be firmly strapped in place to prevent it from shifting or moving on the running board, and whereby the trunk may be quickly released for removal from the carrier.

SPRING-TIRE.—I. JAMES, Taylor, P. O., Scranton, Pa. An object of the invention is to provide a tire formed of an inner stiff ring, outer flexible members and springs arranged therebetween for taking up the shock when the device is in use. A further object is to provide a tire which may be used on any desired form of wheel.

Designs

DESIGN FOR A SIFTER-BOX OR SIMILAR ARTICLE.—L. MORSE, care of Rite Specialty Co., 35 W. 36th St., New York, N. Y. The figure in this design consists of a cat the sifting portion being in the head.

DESIGN FOR A FIGURE TOY.—L. MORSE, care of Rite Specialty Co., 35 W. 36th St., New York, N. Y. The design shows the figure of a toy soldier standing on top of a bale.

DESIGN FOR CRETONNE OR OTHER TEXTILE FABRIC.—M. W. RYAN, care of W. H. Brown & Co., 395 Broadway, New York, N. Y. The figure is a plan view of a portion of a textile fabric with the design printed thereon.

DESIGN FOR CRETONNE OR OTHER TEXTILE FABRIC.—M. W. RYAN, care of W. H. Brown & Co., 395 Broadway, New York, N. Y. The design shown in the figure is a plan view of a portion of textile fabric.

DESIGN FOR CRETONNE OR OTHER TEXTILE FABRIC.—M. W. RYAN, care W. H. Brown & Co., 395 Broadway, New York, N. Y. The figure shows an ornamental design for a ecrtonne or other textile fabric.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of patentee, title of the invention, and date of this paper.

America Faces A War Tragedy

(Continued from page 123)

experience behind it. Not theirs is the ability to go to a bank, as a business man goes, and borrow, borrow, borrow. Even the Farm Loan, widely heralded as the beginning of the cultivation millenium, is denied the Project people, because the Government already has a lien on their land until the water right is paid for. This is a curious thing—Uncle Sam says to his people: "I have spent three thousand dollars on your hundred acres to give you water. You have twenty years to pay me back, without interest. I hold your land security for your debt to me. But I will not loan you another three thousand dollars to make your land more productive and more valuable as security. Let George do it."

And "George"—the banker—naturally won't without a prohibitive interest, because to do so makes him assume the lien and may leave him with a farm on his hands.

But in spite of the fact that the Government did not pass the bill giving $5,000,000 to help the farmers add to their tillage, in spite of the fact that Reclamation people cannot get U. S. Farm Loans, and in spite of the fact that the only aid which was really offered them was encouraging words and the use, to some extent, of Reclamation workmen, farm tractors and such machinery as the service could turn over to the farmers—in spite of all this, Reclamation Project acreage was increased by 150,000 almost overnight. What the increase is in farms not on such Projects cannot be told, but it is enormous—probably not less in percentage than the 17.5 of the Project people. And now thousands of farmers are facing a question which will try their patriotism and their loyalty as perhaps patriots were never tried before. They have a greater crop in prospect than they can sell.

Sell at any price, anywhere. With the country groaning over the high cost of living, crops will rot in the ground, fruit will decay on and under trees, unless something is done, done quickly, and done by the Federal Government, for these men it has pleaded with to plant and reap, sow and gather an increased crop. On four Projects there are 12,000 carloads of potatoes in sight. There is storage for less than 15 per cent of this available. There are no cars to carry the potatoes East. The railroads are so busy carrying coal *west* they haven't a car to spare to cross the Rockies toward the Mississippi. Well they know that once a car gets over the Divide it comes back three, six, nine months later, if it ever comes at all.

What are these people to do with these potatoes?

The potatoes are only a part of the problem. There is fruit, onions, perishable crops of all kinds. Normally a bumper crop in fruit means a 30 per cent loss on many Project farms and orchards, because the Reclamation Projects, from their very nature, are remote from purchasing centers, and are too new to have, as yet, the storage, canning, or manufacturing facilities to take care of more than a certain size of crop.

What are these men going to do? What is the government going to do? "Desiccate" says some one. A fine answer, if it could be realized. Desiccating potatoes means robbing them of 80 per cent of their weight, by removing the water. The product remaining is just as nourishing, just as much food, as it was before, and will keep indefinitely, and occupy a fifth of the space taken by undesiccated potatoes. Four $15,000 evaporating plants on four Projects would take care of these 12,000 carloads of the best potatoes grown in the United States, and also a great deal of fruit—peaches, apples, prunes, berries—but where is the money, and the authority to erect these plants? More, how can they be erected in time? The potatoes *must* be out of the ground and in storage before the end of October. That means they must be started out of the ground by the 20th of August—and these words appear in print on the 18th of August.

(Concluded on page 126)

America Faces A War Tragedy

(Concluded from page 125)

The canning industry of the United States is swamped with fruit and vegetables to can. They can't take care of the stuff that is being thrown at them; for the perishable problem, here stated in concrete figures as affecting a few Reclamation Projects, is a national problem. We can take care of our corn and our wheat and our alfalfa—we can manage our hogs and our cattle and our cereals, but our perishable product is going to deserve its name as never before if something isn't done and done quickly.

"But why? Why can't we take care of the food we have grown?" So asks the man in the street, and there is no one to give an authoritative answer. But one can make a pretty good guess. War has turned our economic system, always loose, never precise, always interfered with by politics and competition between great interests and a lack of coördination in transportation—war has turned us from even a moderate degree of efficiency to a chaotic mass of people who are beginning to "muddle through" with a depth of "muddle" compared to which England's was order most precise.

Our railroads are swamped with goods and supplies and freight—for the Government. Food speculation has choked warehouses full—held for higher prices. Fear of the future has kept many industries which should be expanding from growing—canneries, storage warehouses, dehydrating plants which might have been prepared in advance for the bumper crops of perishables patriotism has and is producing, were not built. Railroads, lending all the coöperation possible without being run by one central authority, are obeying Government commands, and short-sighted beaurocracy is giving right of way to coal and oil and freight and demanding deliveries without regard to the absolute need of cars, cars, cars for potatoes and fruit, onions and berries. Government has called farmers to the Army and Navy—industrial establishments have howled for labor until those who hoe have heard and many have dropped hoes to take higher wages in factories.

It is up to the United States Government—which means the Senate and the House, first—to answer and answer quickly. As this article is going to press, the long debated Food Bill has only just been passed.

If there is a loss of perishable food from 50,000 acres of Reclamation Project land, some gentlemen in Congress are apt to hear from it later. But if there is this loss in Reclamation Projects, and a similar percentage generally over the whole country because of lack of authority and money to conserve the food planted, cultivated and ready because of that request which was hardly less than a command from the President and his cabinet officers, *what sort of result is it going to have on next year's planting?*

Farmers who have spent from forty to sixty dollars an acre putting new land under cultivation, buying seed, labor, the use of machinery, will face ruin if they have to lost it. The crops of fifty thousand acres lost means $2,500,000 to a small group of people—the Reclamation Project people. If they lose it, having rallied to Uncle Sam's appeal, because Uncle Sam turns a deaf ear to their necessity, after his implied promise that "what you do, I'll stand by" will they ever do it again?

A Fire-Fighters' Record

RECENTLY the Monday morning papers carried an account of a test made by the New York Fire Department which, while wholly lacking in pictorial features, was probably as spectacular an achievement from the engineering viewpoint as anything ever undertaken by the Fire Department. This was nothing less than the delivery of water at effective fire-fighting pressures to the observation platform of the Woolworth Building, 730 feet above the street.

We have from time to time been warned of the extra fire hazard of the skyscraper. We have been told that one excellent reason for minimizing building heights is that, with such structures as we have in our larger cities, in the event of a blaze in the upper stories all the firemen could do would be to sit about and wait for the fire to burn down to a point where they could reach it; and that accordingly the entire portion of the structure above this deadline would be doomed to inevitable destruction.

The Fire Department has now demonstrated the fallacy of this theory, and, in the words of Chief Kenlon, has shown that, fast as the construction engineers are moving upward, the fire fighters are keeping well above them. Indeed, the Sunday morning test of which we speak indicated that the pumps at the disposal of the Department are right now capable of sending water to a height 1,000 feet—300 feet further than there is any present possibility of their having to send it.

An engine standing in the street was coupled up, by means of a hose connection, with the base of the standpipe which runs up through the building, and from the upper end of the pipe a hose was carried to the edge of the observation gallery. Three minutes after water was turned into the system the hose began to spit a steady stream out over the rail—at such a height that before it could reach the street again it was broken into an impalpable spray which the few passersby were wholly unable to notice. Various combinations of pump hose and nozzle were used in the 21 tests which were made, one after the other; and in every case the water arrived at the nozzle with a pressure of 32 to 69 pounds, and at a velocity of 161 to 342 gallons per minute. A noteworthy feature of the tests was that they bore out completely the formulae which the department has been using for friction losses, etc.; in every case the observed nozzle pressure was almost exactly what these formulae stated that it should be. It goes without saying that only the finest grade of hose would support the pumping pressures of 350 to 400 pounds necessary for this stunt.

Wood as a Gas Making Material

THE question of the employment of wood in part replacement of coal in gas-making has lately been receiving considerable attention and trials have recently been carried out in France on a working scale, in the gasworks of Landes. The wood used was the sea pine, in the form of billets cut from the middle of the trunk. The charge of the wood was about half the weight of that of coal and carbonization occupied about half the usual time. When running one retort with wood to every two with coal, no appreciable difference in the calorific power of the gas was noted. Of the two by-products—small coke and tar—the former amounts to 5 to 10 per cent. The tar from the combined distillation of wood and coal is much lighter than common tar, and is more difficult to separate from water in the condenser. Owing to the acid character of certain of the products of the distillation of wood, *e. g.*, acetic acid—trouble may be caused in the condensing plant unless the proportion of coal is sufficient to yield ammonia in the quantity necessary to neutralize the acids. The yield of gas from the wood was found to be substantially equal to that from coal.

An Investigation of the Katmai Eruption

THE National Geographic Society of Washington is sending out an expedition to complete the studies made by the society in 1913, 1915 and 1916 on the site of the great eruption of Mt. Katmai, Alaska, in June, 1912. The expedition is led by Prof. R. F. Griggs, of the Ohio State University.

Testing Transformer Oils

UNDER the direction of the Bureau of Standards and the American Society for Testing Materials, experimental investigations have been begun by certain electrical manufacturers and oil producers upon the methods of testing transformer oils for dielectric strength. The object of the experiments is to secure uniformity throughout the industry.

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(14242) E. A. A. asks: Permit me to ask some questions: What is the most plausible sypothesis so far advanced concerning the condition of the interior of the earth? Are there any investigations along this line being conducted at the present time? I understand some still hold that the earth is a rigid solid, while others maintain that the inside is in a fluid condition. Which theory finds the greatest favor? As the books to which I have access give but little light on the subject, I would ask that you please inform me of some good source of information on the subject. A. The belief is general among geologists that the interior of the earth is solid. The statement in Chamberlain and Salisbury's College Geology, page 10, is, "From the weight of the earth, it is inferred that its interior is much more dense than its surface. From its behavior under the attraction of other bodies, it is believed to be at least as rigid as steel, and its interior cannot therefore be liquid in the usual sense of that term. We will send the book for $3.80. There is a very excellent chapter on the interior of the earth in Tarr's College Physiography, price $3.75, postpaid. We are not aware of any investigations in progress upon this point at the present time.

(14243) W. C. J. asks: Will you please send me some information about the Sargasso Sea, in the Atlantic Ocean, as to position, character, accessibility, and whether there are any partly submerged ships there or not I have been interested in this spot for years and I would like some positive information on the subject, also, if you can, tell me if it is inhabited by red gnats, or other poisonous insects, A. The Sargasso Sea is a great eddy in the North Atlantic Ocean caused by the equatorial drift and the trade winds. In the center of the whirl is much floating seaweed, sargassum, which gives it its name. We have sailed through this area and have no recollection of the gnats. It occupies a large portion of the area between the Gulf Stream and Africa and South America's north coast. Patches of weeds were occasionally seen as we sailed through, for a number of days. You will find this sea laid down on maps in Physical Geographies and Physiographies. It is as accessible as any other part of the Atlantic Ocean.

(14244) D. L. H. asks: Will you please explain about the use of the phrase "primary colors." These were formerly said to be, red, yellow and blue. This seems to be the natural group, since, if the colors of the spectrum be arranged in a circle the other colors are formed by the overlapping of these. Thus: *red, orange* = red-yellow, *yellow green* = yellow-blue, *blue, violet* = blue-red. The present grouping is thus given in the SCIENTIFIC AMERICAN, page 263: "There are three primary colors, red, green and blue-violet, which when blended in equal proportions, produce the sensation of white light." This certainly makes them complementary, but does it make them primary colors? It is further stated that "by mixing some or all of these three colors in suitable combinations, we obtain all the colors or shades of them." This must be true or it would not be stated in your thoroughly reliable journal, but I cannot make it seem possible that, for instance, yellow can be made by mixing any or all of these, so called, primary colors. Will you kindly inform me how to make yellow by mixing some or all of the colors, red, green and blue-violet? I am intensely interested in all that appears in your valuable paper A. The term "primary colors" is used in several senses. The Century Dictionary gives three senses; "First, the seven colors into which Newton arbitrarily divided the spectrum, viz., red, orange, yellow, green, blue, indigo and violet. Second, the colors, red, yellow and blue, from the mixture of which it was *erroneously* supposed (from the facts of the mechanical mixture of pigments), all other colors could be produced. Third, red, green and violet, light of the spectrum, from the mixture of which all other colors can be produced." Green light cannot be produced by the mixture of yellow and blue lights. The result is always white light, since yellow and blue are complementary colors. There are many pairs of complementary colors. There cannot be *three* complementary colors. One color is the complement of another when it fills up what the other lacks of being white. Two colors which together form white light are complementary. The circle of color which we have written for you as lights, give ten colors, so arranged that the opposite colors are complementary; thus, red and greenish blue, yellow and indigo blue, when mixed, give white light. The alternate colors, when mixed, give the color between. Thus red and violet mixed give purple. Green cannot be produced by mixing yellow and blue lights. Yellow and blue pigments when mixed given green paint. Why? The blue pigment absorbs nearly all the red, orange and yellow of the light, and reflects only the green, blue, indigo and violet, while the yellow pigment absorbs the blue, indigo and violet of the light and reflects red, orange, yellow and green. The result of mixing the yellow and blue pigments is that only green is left unabsorbed by both and this alone is reflected by both. Hence green paint is made by mixing yellow and blue paints, but the yellow and blue colors are in no sense mixed in the paint. A microscope will show the yellow and blue grains in the green paint as distinctly as if they were separate. They are unaltered. The primary color sensations are in the generally received theory, that known by the names, Young-Helmholtz, are red, green and violet. Vermilion red and emerald green lights when mixed give a yellow color sensation. If you have a high school in your town, probably the teacher of science in the school can give you the demonstration which you desire of this fact. Some apparatus is required which a high school should possess. The demonstration is very simple. The two colors are brought into the eye together so that one gets their combined effect. Or they can be projected with a lantern on a screen, one over the other, and their combined color sensation determined.

(14245) A. C. asks: Will you please advise me of a number, or article in the SCIENTIFIC AMERICAN, or elsewhere which proves that sound vibrations traverse the wires of the electric telephone. A. Sound does not traverse the wire of the telephone circuit. Only an electric current travels along the line from the transmitter to the receiver at the other end of the line. This current is made vibratory by the impulses of the air sent against the microphone of the transmitter, These electrical vibrations exert an effect upon the diaphragm of the receiver and set it into vibration at exactly the same rate as the vibration of the transmitter. These vibrations of the diaphragm of the receiver are heard as sound. There is no sound at any point between the transmitter and the receiver. Only electricity crosses the space between the two instruments.

(14246) A. R. F. asks: I am told that there appeared in your publication about ten or twelve years ago, *an article proving from a scientific viewpoint that it was impossible for a pitcher to "curve" or "drop" a baseball, and describing several conclusive tests made* on big league pitchers. The ordinary fan believes he can. I am anxious to know exactly. I should appreciate it very much if you could refer me to the desired issue. A. The article to which you probably refer is to be found in the SCIENTIFIC AMERICAN Vol. 111, No. 7. It is a letter from a correspondent on page 114. This is preceded, as such letters always are, by the statement "The Editors are not responsible for statements made in the Correspondence Column." The writer questions the fact that a ball can curve. He was followed in Vol. 111, No. 19, by one in the same column *affirming* the fact of curving. Now as to the positive side of the question: In SUPPLEMENT, 1992, page 146, is an article by Professor Franklin of Lehigh University, which demonstrates the process of curving. In the SCIENTIFIC AMERICAN Vol. 104, No. 6, page 136, is a long article by Professor J. J. Thompson of Cambridge, England, (than whom there is no higher authority in mathematical physics in the world) in which the curving of a golf ball is demonstrated. An article in the *Popular Science Monthly*, for August, 1913, may also be referred to. The matter is one of common citation in the college text-books of physics. We name Hastings and Beach, page 135; Franklin and McNutt, page 90; Kimball, page 71, and Crew, page 170. We know no mathematical authority who denies the curving of balls moving through fluids while rotating on an axis.

(14247) C. A. P. asks: I have two questions to ask that I have heretofore been unable to have solved. 1. If it was possible to attain temperature and pressure high enough could iron be gassified. 2. Is the center of the earth a large volume of gas? A. 1. With a temperature sufficiently high, iron is readily turned into a vapor. This is the case in the sun. There are immense quantities of iron vapor in the outer layers of the sun, as is shown by the spectroscope. It can also be vaporized by the electric arc. Every substance on earth has been vaporized and every gas has been liquefied and every one frozen, with the possible exception of helium alone. 2. It is very improbable that the center of earth is liquid or gaseous. There is at the earth's center immense pressure which tends to produce an immensely high temperature as you say, but there are two classes of substances on the earth with reference to melting by heat and pressure. The first class is represented by ice, which expands when it freezes and so floats on water. Ice is more bulky than the water from which it froze. Now if the ice is compressed to the volume of the water from which it was formed, it will be melted by the pressure, without receiving any heat from the outside. That is, it melts at a lower temperature under pressure than when in the open air. There are but a few such substances known. The second class of substances behave in exactly the opposite manner. They contract upon turning solid, and so are heavier in the solid than in the liquid condition. As an example, take a piece of a wax candle and partly melt it. The solid wax sinks in the liquid. It does not float as ice does on water. It is smaller, denser, heavier, in the solid than in the liquid form. It must expand to melt. If we compress it, make it denser, heavier, we carry it farther from melting and the greater the pressure the hotter it may be made without melting. The rocks, lead, pure iron and most metals belong to this class of substances. Solid lead sinks in melted lead. The more the pressure the hotter they may be made and still not melt. So as you go down into the earth it becomes hotter, but the stones and metals are still solid. Astronomers and geologists believe the earth to be solid to the center.

NEW BOOKS, ETC.

INTERIOR WIRING. Systems for Electric Light and Power Service. By Arthur L. Cook. New York: John Wiley & Sons, Inc., 1917. 12mo.; 426 pp.; illustrated. Price, $2 net.

The author, who is head of the Department of Applied Electricity at Pratt Institute, gives us a more extended survey of electric lighting and power applications than is usual in similar handbooks. The chief beneficiaries will be superintendents, operators and wiremen, and these will find their problems plainly stated, with clues to the most approved methods of solving them. Parts I and II give a comprehensive idea of the types of lamps and motors and the conditions under which each type is at its best. Part III describes apparatus and fittings for interior wiring, details, methods of calculating the sizes of circuits for varying requirements, and by examples illustrates and explains typical lighting and power applications reproduced from actual installations. Only simple mathematics are employed in the calculations.

THE AVIATOR AND THE WEATHER BUREAU. By Ford A. Carpenter, LL.D., Meteorologist. San Diego Chamber of Commerce, 1917. 16mo.; 54 pp.; illustrated.

It is well to remember that the weather service of our country began with the Signal Corps of the Army; in Dr. Carpenter's attractive little volume we are shown the Weather Bureau and the aviator in active coöperation. There is a sketch of the Signal Corps Aviation School at San Diego, a chapter on applied meteorology for the aviator, a narrative of weather observations from an aeroplane, and a statement of methods and results in upper air investigation; there are also 23 interesting plates of the machines, the instruments and the men that are accomplishing this work, and of the scenes of their flights, as well as five charts that convey clear ideas of flights, wind velocities and temperatures. All explanation is simply phrased and goes into sufficient detail to make it of distinct value to all who are interested either in weather or in aviation.

THE PRACTICAL BOOK OF EARLY AMERICAN ARTS AND CRAFTS. By Harold Donaldson Eberlein and Abbot McClure. Philadelphia: J. B. Lippincott Co. 8mo. 339 pp. Price, $6.00.

The authors have made a distinct contribution to the literature of home life enrichment. The beautiful volume before us is a scholarly treatise on American glass, Mexican majolica, American ironwork, copper, brass, lead and tin, needlework, silver plate and goldsmithing, pewter, pottery, decorative painting on household gear, portraiture and allegorical painting, coverlets and carpets, illumination, handblock printing, carving and lace. The aim of this book is to present a thorough-going informative and practical guide to the arts and crafts of our forefathers. It is intended for both the use of the collector, and the general reader. There are still opportunities for the collector to obtain desirable specimens if he is properly posted as to what to buy and approximately where such articles can be bought. The period goes back to the beginnings of permanent European colonization, on the continent of North America on the one hand, and on the other, includes the earlier years of the nineteenth century. The rich and broad field which lies open to the collector, is in some directions almost untouched The volume is the result of years of first-hand investigation, and has grown out of small beginnings in the form of articles which appeared in *American Homes and Gardens*, and other publications of a similar nature. So far as we are aware, the authors were the first to devote any systematic consideration, in periodical form, to most of the subjects herein treated, emphasizing elements of craftsmanship and historical significance. The various articles provoked such a correspondence in discussion that the interest for this book became apparent. The authors have performed their task in an exceedingly competent manner, and the book is most beautifully illustrated. It should be in the hands of all collectors and those who like to know how our forefathers lived. It is an exceedingly valuable book.

AN HISTORICAL ATLAS OF MODERN EUROPE FROM 1749 TO 1914. By C. Grant Robertson and J. G. Bartholomew. New York: Oxford University Press, 1915. Quarto, 24 pp. of text, 56 pp. of maps. Price, $1.50.

The period dealt with by the authors and geographers takes up Europe from the French Revolution to the present day. The sad political history, and conditions of today, require some knowledge of what made the Europe of today, and which are the essentials preliminary to any intelligent interpretation of foreign affairs. The absence of maps of a good scale at a modern price has long been noticed. The present work admirably fills this want. The maps are very clear and are not over-burdened with unnecessary detail. The very latest developments as to the partition of territory in the war are indicated. There is excellent text accompanying all of the maps.

CHILI. Published by the Chilean Government, 1915. 8vo.; 301 pp.; illustrated.

The quaint English of this attractive bulletin serves only to add interest to its abounding information, and is seldom allowed to cloud the meaning of a sentence. Those who already know something of what Chili has to offer to the traveler, the investor and the immigrant may refresh and appreciably increase their knowledge by the use of this volume; those to whom Chili is little more than a name are due to experience amazement and admiration. Physical features, climate, flora and fauna, and population and sanitation, are set before the reader in a few vigorous pages; there is enough of history to show the birth of national ideals and the foundations of the present high civilization; the system of governmental and judicial administration is explained, finances are carefully set forth; the naval and military organization receives full attention, and exceptional educational facilities are shown. Chili has literature, art and music, all tinged with a distinctive national character; many of her beautiful buildings are pictured, while other of the numerous cuts illustrate her extensive agricultural, mining and industrial activities to which a considerable portion of the text is devoted.

ITALY, FRANCE AND BRITAIN AT WAR. By H. G. Wells. New York: The Macmillan Company, 1917. 8vo.; 285 pp. Price, $1.50.

In his own peculiar and inimitable way, Mr. Wells has here recorded his own keen observations and valuable deductions as called forth by an unwilling tour of two of the great fighting fronts. His unique strength seems to lie in his capacity for taking in breadth and detail with equal facility. More than ever is it emphasized that this is a war of industry against industry; that the clanking of equestrian accouterments and the gallant charge in the open has suddenly become ancient history; the farmer and the mechanician are pitted against the farmer and the mechanician; science and industrial organization will win the war and military strategy has already taken second place. The final section raises the question whether the peoples involved are really doing any constructive thinking at all; the various types of pacifist are felicitously sketched; the social changes in progress are set forth in incident and conversation, and the religious revival and the ending of the war are discussed in that engrossing manner for which the author is noted.

MAHIN'S ADVERTISING DATA BOOK, 1917. New York: John Lee Mahin. Price, $2.

ADVERTISING. Selling the Consumer. By John Lee Mahin. Garden City, N. Y.: Doubleday, Page & Company, 1916. 8vo.; 321 pp.; illustrated. Price, $2 net.

Times have changed since the psychology of advertising was summed up in the maxim, "Repetition is the law of memory," and the eye was wearied by regiments of trade names in solid formation. Advertising is now recognized as "the greatest force in the economical distribution of the fruits of industry," and its psychological applications have become as complex as industry itself. "Advertising" is the revised edition of a work by a well-known specialist in which modern principles are unfolded for the benefit of those who are drawn toward this constructive, fascinating profession. Advertising can appeal only to free dollars; it is a true service mutually beneficial to producer and consumer. Such are the opening propositions of Mr. Mahin's volume, which goes on to list the tools of the profession and explain their uses and limitations; to discuss and analyze mediums, and to expound the building of an advertisement and the application of the five tests; other striking chapters deal with retail advertising, price maintenance, and coöperation between "advertising, the missionary, and salesman, the closer." The work is a successful, comprehensive survey of advertising organization to be unqualifiedly commended to all students of publicity. The little "Advertising Data Book" contains in vest-pocket space condensed facts and statistics; population, income, "free dollars," trademarks, and the local and general mediums of the United States and Canada, are set forth in lucid paragraphs and crisp tabulations, and small but adequate colored maps make easy the location of all towns mentioned.

ANCIENT TIMES. A History of the Early World. An Introduction to the Study of Ancient History and the Career of Early Man. By James Henry Breasted, Ph.D., Professor of Oriental History and Egyptology. Boston and New York: Ginn and Company. Price, $1.60.

Set forth in a style of crystalline clearness, the subject-matter of this delightful volume is marvellous in its breadth and depth. Age after age of the human race passes before us; but wars and dynasties are not, as in the case of so many historians, considered the whole duty of man; rather we touch human life in all its varied manifestations, learning of the intimate phases of society, invention, work, religion and art; it is a continuously unfolding view of the evolution of civilization from the earliest Nile-dwellers down through the triumph of the barbarians and the end of the ancient world. In defense of the space devoted to the Orient, the author points out that modern discoveries there have doubled the historic period and that her monuments and documents are more extensive then those of Greece and Rome combined. He has wisely utilized the pictorial monuments and records in such a way as to interest the young student and convey the significance of certain historical phases, and has succeeded in making those far-off times again glow with life and meaning. There are numerous and noteworthy colored plates, dealing with scenery and art, six beautiful full-page etchings, and smaller illustrations on almost every page; then there are half a hundred carefully-drawn maps and a pronouncing index. The volume is admirable for the high-school student, but it would be a pity if its usefulness were restricted to the young; it should find eager readers in all walks of life, for in nearly everything it attempts it touches the summit of excellency.

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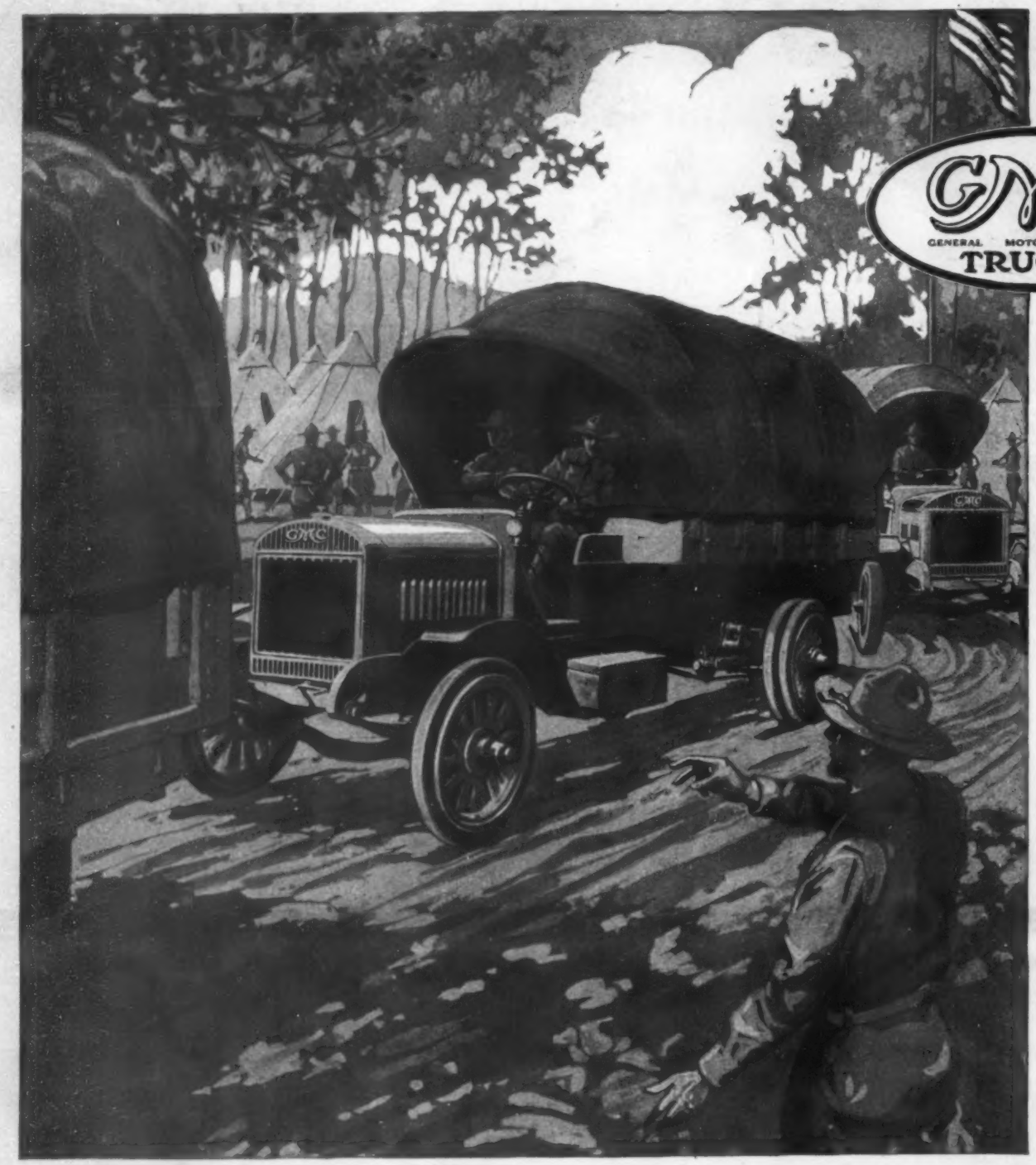

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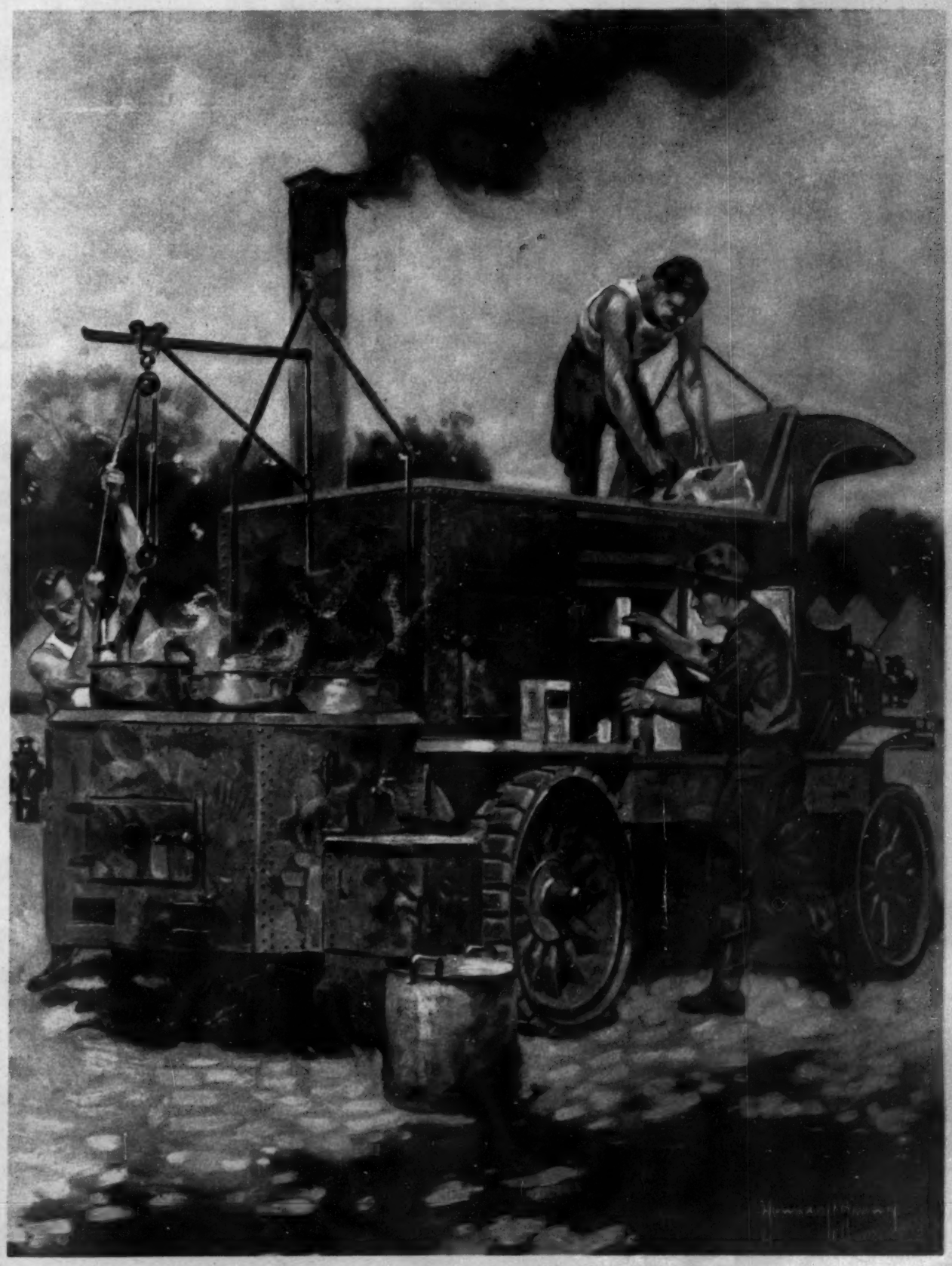

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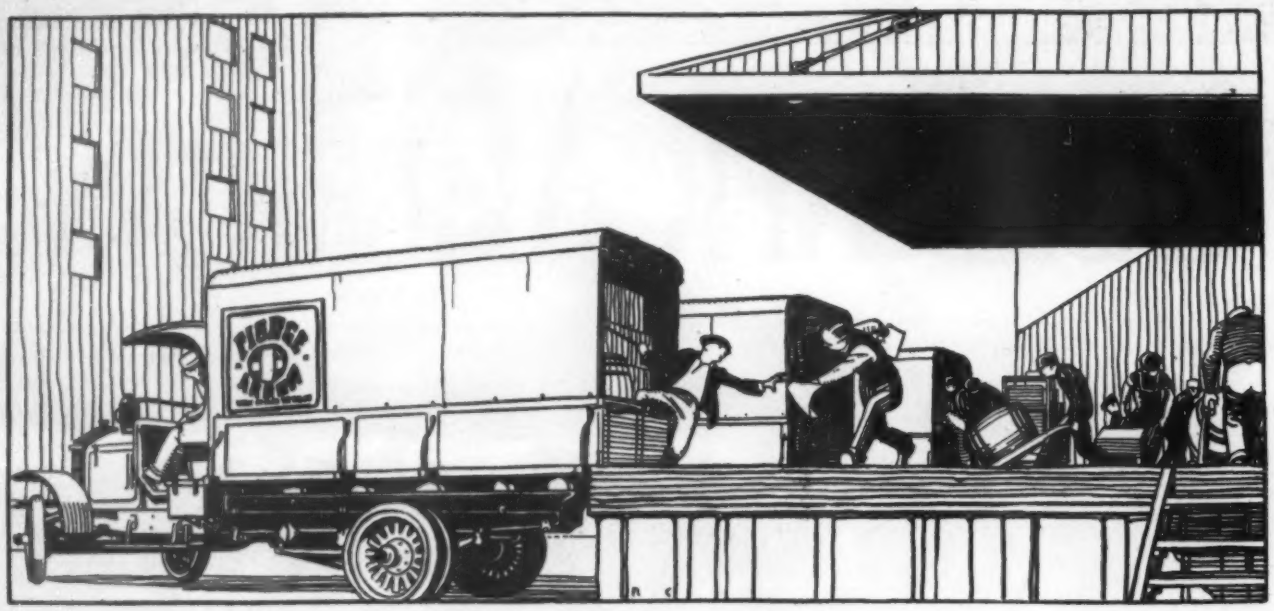

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